Blue Book Edition 17 Part 2

TECHNICAL REPORT

Comprehensive Semantic Model

for Energy Management

COSEM Interface Classes

DLMS UA 1000-1 Ed. 17 Part 2

Version 1.0

28th February 2025

DLMS User Association

CONTENTS

FOREWORD

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Status of standardisation

The contents of this edition is the basis of future revisions to:

- IEC 62056-6-2, Electricity Metering Data Exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes.

Revision history

Version	Date	Author	Comment
Release 1	01 April 1998	DLMS UA	Initial version
First Edition	12 Nov. 1998	DLMS UA	Considering comments received after R1
Second Edition	03 May 1999	DLMS UA	Major rework, classes and associations added
Third Edition	29 Feb. 2000	DLMS UA	Major rework, adapted to CDVs of IEC TC13, OBIS added
Fourth Edition	25 March 2001	DLMS UA	Considering comments to CDVs by IEC National Committees
Fifth Edition	05 March 2002	DLMS UA	Content adapted to IEC International Standards
Sixth Edition	16th August 2004	DLMS UA	Content adapted to draft IEC 62056-61 Edition 2, draft IEC 62056-62 (CD versions) and EN 13757-1:2002
Seventh Edition	12th September 2005	DLMS UA	Content adapted to 13/1341/CDV, draft IEC 62056-61 Edition 2, 13/1342/CDV, draft IEC 62056-62 Edition 2 and comments received on these drafts, as well as on EN 13757-1:2002
Eighth Edition	14th September 2007	DLMS UA	Document restructured, editorial errors in Ed. 7.0 corrected.
Ninth Edition	9th February 2009	DLMS UA	New elements for smart metering and advanced gas volume and energy conversion added.
Tenth Edition	26th August 2010	DLMS UA	Brought in line with Green Book. New interface classes and new versions of interface classes added. New OBIS codes added.
Eleventh Edition	26th August 2013	DLMS UA	New interface classes and new versions of existing interface classes added. New OBIS codes added.
Twelfth Edition	10th September 2014	DLMS UA	New interface classes and new versions of existing interface classes added in support of Security management, Payment Metering, Arbitrator, Compact data, Data protection, Push setup, G3-PLC, M-Bus,New OBIS codes added.
Twelfth Edition Corrigendum 1	21st December 2015	DLMS UA	Technical and editorial corrections
Edition 12.1	21st December 2015	DLMS UA	Consolidated edition including the Corrigendum 1.
Edition 12.2	21st December 2016	DLMS UA	New or updated interface classes for Function Control, Array Manager, NTP setup, Compact data,GSM-related and HS-PLC networks added. New OBIS codes added

Version	Date	Author	Comment
Edition 13	8th May 2019	DLMS UA	SI units, communication port protection, heat cost allocator, thermal energy, water OBI codes added. Additional codes for reactive power added.
Edition 14	31st Aug 2020	DLMS UA	WiSUN, LPWAN, LTE monitoring, Parameter monitor, support for ISO/IEC 14908 PLC networks added; Push IC now V2; Delta values introduced; new clock objects added
Edition 15	23rd December 2021	DLMS UA	Added IEC 62055-41 Attributes V0, G3-PLC Hybrid RF MAC layer counters V0, G3-PLC Hybrid RF MAC setup V0 and G3-PLC Hybrid 6LoWPAN adaptation layer setup V0 Push IC now v3, M-Bus client now V2, G3-PLC MAC setup now V2, G3-PLC 6LoWPAN adaptation layer setup now V3, Meter point ID object corrected to “61” in 6.3.6 Classes added to support CoAP in 4.9
Edition 16	30th October 2023	DLMS UA	Adapted existing G3-PLC ICs and added new ICs to support G3-Hybrid New “Measurement data monitoring” IC added Updated Disconnect control IC New “Measurement data monitoring objects” IC Measurement algorithm objects table: Add new entries for “Measurement algorithm for distortion power” and “Measurement algorithm for distortion energy”
Edition17	28th February 2025	DLMS UA	See table below

List of main technical changes in Edition 17

Item	Clause	Description
1.	4.3.6.2.1	Modified minimum value of “profile_entries” from “1” to “0” (according to corrigenda approved in CSWG)
2.	4.3.6.2.8	Modified minimum value of “profile_entries” from “1” to “0” (according to corrigenda approved in CSWG)
3.	4.3.10.2.3	Update to Table 9 to add “last confirmed entry” for MS Byte upper nibble parameters 0x6 to 0x2 (from Contribution 125)
4.	4.4.8	Update to Clause 4.4.8 “Push interface class” and sub-clauses to increase clarity of description. No update to version number is required (from Contribution 125)
5.	4.5.8	Updates made to Disconnect control class (class_id = 70) to support a metrologically relevant remote display. Version updated to version =2. Previous version moved to 5.5.2 (from Contribution 130)
6.	4.20	New Clause for Attestation class (from Contribution 109)
7.	6.2.28	Correct OBIS D values (to 3, 4, 5) for G3-PLC hybrid objects (from corrigenda request)
8.	6.2.36	New OBIS code for Attestation IC (from Contribution 109)

INTRODUCTION

Object modelling and data identification

COSEM was originally developed to address the requirements for interoperability and data security requirements in metering and control applications. The specification is not however limited to metering and control, it can be used to model any type of device that is designed to be connected to a communications network. (The COSEM acronym originally was *Companion Specification for Energy Metering* this no longer applies and has been modified to *Comprehensive Semantic Model for Energy Management* to reflect its wider application.)

COSEM uses *object modelling* techniques to model all functions of devices, without making any assumptions about which functions need to be supported, how those functions are implemented and how the data is transported. The formal specification of COSEM interface classes forms a major part of COSEM.

To process and manage the information it is necessary to uniquely identify all data items in a standard way. The definition of OBIS, the *Object Identification System* is another essential part of COSEM. It is based on DIN 43863-3:1997, *Electricity meters – Part 3: Tariff metering device as additional equipment for electricity meters – EDIS – Energy Data Identification System.* The set of OBIS codes has been considerably extended over the years to meet new requirements.

COSEM models the device as a *server* application – see 4.1.7 – used by *client* applications that retrieve data from, provide control information to, and instigate defined actions within the device via controlled access to the COSEM objects. The *clients* act as agents for third parties, i.e. the business processes of energy market participants.

The standardized COSEM interface classes form an extensible library. Manufacturers use elements of this library to design their products that meet a wide variety of requirements.

The server offers means to retrieve the functions supported, i.e. the COSEM objects instantiated. The objects can be organized to *logical devices and application associations* and to provide specific access rights to various clients.

The concept of the standardized interface class library provides different users and manufacturers with a maximum of diversity while ensuring interoperability.

ELECTRICITY METERING DATA EXCHANGE – THE DLMS/COSEM SUITE –

Part 2: COSEM interface classes

1 Scope

The DLMS/COSEM specification specifies a data model and communication protocols for data exchange with metering equipment, and more generally, devices for energy measurement, control and management. It follows a three-step approach as illustrated in Figure 1.

Step 1, Modelling: This covers the data model of devices for metering equipment, and more generally, devices for energy measurement, control and management as well as rules for data identification. The data model provides a view of the functionality of the meter, as it is available at its interface(s). It uses generic building blocks to model this functionality. The model does not cover internal, implementation-specific issues.

Step 2, Messaging: This covers the communication services and protocols for mapping the elements of the data model to application protocol data units (APDU).

Step 3, Transporting: This covers the services and protocols for the transportation of the messages through the communication channel.

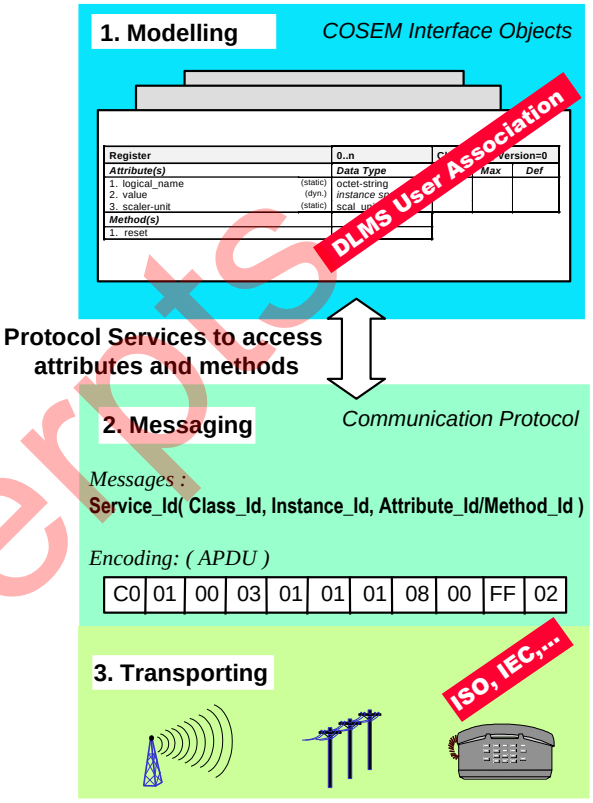

Figure 1 – The three steps approach of DLMS/COSEM: Modelling – Messaging – Transporting

Step 1 is specified in the two parts of this document. The OBIS object identification system is specified in Part 1 (DLMS UA 1000-1 Ed 17 Part 1:2025). This Part 2 specifies the COSEM interface classes (ICs) and the use of interface objects for modelling the various functions of the devices.

Steps 2 and 3 are specified in the Green Book, DLMS UA 1000-2 Ed.11:2021. It specifies communication profiles for various communication media and the protocol layers of these communication profiles. The top layer in any profile is the DLMS/COSEM application layer. It provides services to establish a logical connection between the client and the server(s). It also provides the xDLMS messaging services to access attributes and methods of the

COSEM interface objects. The lower, communication profile specific protocol layers transport the information.

Rules for conformance testing are specified in the “Yellow Book”, DLMS UA 1001-1 "DLMS/COSEM Conformance Test Process".

Terms are explained in the “White book” DLMS UA 1002, "COSEM Glossary of Terms".

2 Referenced Documents

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

DIN 43863-3:1997, *Electricity meters – Part 3: Tariff metering device as additional equipment for electricity meters – EDIS – Energy Data Identification System*

DLMS UA 1000-1 Ed 15 Part 1:2021, OBIS Codes, Blue Book Part 1

DLMS UA 1000-1 Ed 17 Part 1:2025, OBIS Codes, Blue Book Part 1

DLMS UA 1000-1 Ed 15 Part 2:2021, COSEM Interface Classes, Blue Book Part 2

DLMS UA 1000-2 Ed. 10:2020, DLMS/COSEM Architecture and Protocols, the “Green Book” Edition 10

DLMS UA 1000-2 Ed.11:2021, DLMS/COSEM Architecture and Protocols, Green Book

DLMS UA 1001-1 DLMS/COSEM Conformance test and certification process, the “Yellow Book”

DLMS UA 1002 COSEM Glossary of terms, the “White Book”

IEC TR 61000-2-8:2002 Electromagnetic compatibility (EMC) – Part 2-8: Environment - Voltage dips and short interruptions on public electric power supply systems with statistical measurement results

IEC 61334-4-32:1996 Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 32: Data link layer – Logical link control (LLC)

IEC 61334-4-41:1996 Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 41: Application protocols – Distribution line message specification

IEC 61334-4-511:2000 Distribution automation using distribution line carrier systems – Part 4-511: Data communication protocols – Systems management – CIASE protocol

IEC 61334-4-512:2001 Distribution automation using distribution line carrier systems – Part 4-512: Data communication protocols – System management using profile 61334-5-1 – Management Information Base (MIB)

IEC 61334-5-1:2001 Distribution automation using distribution line carrier systems – Part 5-1: Lower layer profiles – The spread frequency shift keying (S-FSK) profile

IEC 62053-23:2003 Electricity metering equipment (a.c.) – Particular requirements – Part 23: Static meters for reactive energy (classes 2 and 3)

IEC TR 62055-21:2005 Technical report Electricity metering - Payment systems- Part 21: Framework for standardization. 2005-8

IEC 62055-41:2018 Electricity metering - Payment systems - Part 41: Standard transfer specification (STS) - Application layer protocol for one-way token carrier systems

IEC 62056-21:2002 Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange

IEC 62056-31:1999 Electricity metering – Data exchange for meter reading, tariff and load control – Part 31: Using local area networks on twisted pair with carrier signalling

NOTE This Edition is referenced in the interface class “IEC twisted pair (1) setup” (class_id: 24, version: 0)

IEC 62056-3-1:2021 Electricity metering data exchange – The DLMS/COSEM suite – Part 3-1: Use of local area networks on twisted pair with carrier signalling

IEC 62056-46:2007,Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol

NOTE This Edition is referenced in the interface class “IEC twisted pair (1) setup” (class_id: 24, version = 1)

IEC 62056-7-3:2017, Electricity metering data exchange – The DLMS/COSEM suite – Part 7-3: Wired and wireless M-Bus communication profiles for local and neighbourhood networks

IEC 62056-8-3:2013, Electricity metering data exchange – The DLMS/COSEM suite – Part 8-3: Communication profile for PLC S-FSK neighbourhood networks

IEC 62056-8-4:2018, Electricity metering data exchange - The DLMS/COSEM suite - Part 8-4: Communication profiles for narrow-band OFDM PLC PRIME neighbourhood networks

IEC 62056-8-6: 2017 Electricity metering data exchange – The DLMS/COSEM suite – Part 8-6: High speed PLC ISO/IEC 12139-1 profile for neighbourhood networks

IEC 62056-8-8:2020 Electricity metering data exchange - The DLMS/COSEM suite - Part 8-8: Communication profile for ISO/IEC 14908 series networks

ISO/IEC 8802-2:1998 IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical Link Control

ISO/IEC 12139-1:2009 Information technology —Telecommunications and information exchange between systems — Powerline communication (PLC) — High speed PLC medium access control (MAC) and physical layer (PHY) — Part 1: General requirements

ISO/IEC 14908-1:2012 Interconnection of information technology equipment – Control network protocol Part Protocol stack

ISO/IEC/IEEE 60559:2011 Information technology – Microprocessor Systems – Floating-Point arithmetic

ISO 4217 Codes for the representation of currencies and funds

ITU-T E.212 (05.2008) SERIES E: OVERALL NETWORK OPERATION,TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS - International operation – Maritime mobile service and public land mobile service - The international identification plan for public networks and subscriptions

3GPP TS 24.008 V13.7.0 (2016-10) Technical Specification Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3

3GPP TS 24.301 V13.4.0 (2016-01) Technical Specification Group Core Network and Terminals; Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3

3GPP TS 24.301 V13.11.0 (2018-01) Technical Specification Group Core Network and Terminals; Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS);Stage 3

3GPP TS 27.007 V16.1.0 (2019-06) Technical Specification Group Core Network and Terminals; AT command set for User Equipment (UE)

3GPP TS 36.101 V15.4.0 (2019-01) Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception

3GPP TS 36.133 V13.11.0 (2018-03) Technical Specification LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management

3GPP TS 36.133 V14.4.0 (2017-06) Technical Specification LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management

3GPP TS 36.213 V15.5.0 (2019-05) Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures

3GPP TS 36.304 V13.8.0 (2018-01) Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode

3GPP TS 36.321 V15.5.0 (2019-05) Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification

3GPP TS 36.331 V15.5.1 (2019-05) Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification

ITU-T G.9903 Amd. 1:2013 SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS – Access networks – In premises networks – Narrow-band orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks

NOTE This Recommendation is referenced in version 0 of the G3-PLC setup classes.

ITU-T G.9903:2014 SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS – Access networks – In premises networks –Narrow-band orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks

NOTE This Recommendation is referenced in version 1 of the G3-PLC setup classes.

ITU-T G.9903:2017 SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS - Access networks – In premises networks - Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks

NOTE This Recommendation is referenced in current version of the G3-PLC setup classes.

ITU-T G.9903 Amd. 1:2021, SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS - Access networks – In premises networks - Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks

NOTE This Recommendation is referenced in version 2 of the G3-PLC setup classes.

ITU-T G.9903 Cor. 1:2023, SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS - Access networks – In premises networks - Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks

ITU-T G.9903 Amd. 2:2023, SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS - Access networks – In premises networks - Narrowband orthogonal frequency division multiplexing power line communication transceivers for G3-PLC networks

ITU-T G.9904:2012 SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS – Access networks – In premises networks – Narrow-band orthogonal frequency division multiplexing power line communication transceivers for PRIME networks

EN 834:1994 Heat cost allocators for the determination of the consumption of room heating radiators – Appliances with electrical energy supply

EN 1434-1:2015 Heat meters – Part 1: General requirements

EN 1434-2:2015 Heat meters – Part 2: Constructional requirements

EN 13757-1:2014 Communication system for meters – Part 1: Data exchange

EN 13757-2:2018, Communication system for and remote reading of meters – Part 2: Physical and link layer

EN 13757-3:2004, Communication systems for and remote reading of meters – Part 3: Dedicated application layer

NOTE This standard is referenced in the “M-Bus client setup” interface class version 0.

EN 13757-3:2013, Communication systems for and remote reading of meters – Part 3: Dedicated application layer

NOTE This standard is referenced in the M-Bus client setup interface class version 1.

EN 13757-3:2018, Communication systems for meters – Part 3: Dedicated application layer

NOTE This standard is referenced in the M-Bus client setup interface class version 1.

EN 13757-4:2013, Communication system for and remote reading of meters – Part 4: Wireless meter (Radio meter reading for operation in SRD bands)

EN 13757-4:2019, Communication system for and remote reading of meters – Part 4: Wireless meter (Radio meter reading for operation in SRD bands)

EN 13757-5:2015,Communication systems for meters – Part 5: Wireless M-Bus relaying

EN 13757-7:2018Communication system for meters – Part 7: Transport and security services

IEEE 802.15.4: 2006 also available as ISO/IEC/IEEE 8802-15-4 Ed 1.0 IEEE 802.15.4-2006 Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs) – September 2006.

IEEE 802.15.4:2020 IEEE Standard for Low-Rate Wireless Networks

IEEE 802.15.4aa-2022 IEEE Standard for Low-Rate Wireless Networks Amendment 4: Higher Data Rate Extension to IEEE 802.15.4 Smart Utility Network (SUN) Frequency Shift Keying (FSK) Physical Layer (PHY)

ETSI GSM 05.08 Digital cellular telecommunications system (Phase 2+); Radio subsystem link control

ETSI EN 303 204 V2.1.2 (2016-09), Network Based Short Range Devices (SRD); Radio equipment to be used in the 870 MHz to 876 MHz frequency range with power levels ranging up to 500 mW; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU

ANSI C12.19:2012 American National Standard For Utility Industry End Device Data Tables

ZigBee® 053474 ZigBee® Specification. The specification can be downloaded free of charge from https://www.zigbee.org/zigbee-for-developers/zigbee-pro/

[FANSPEC] Wi-SUN Alliance: Field Area Network Working Group (FANWG):Technical Profile Specification:Field Area Network:Version 1v26.

[PHYSPEC] Wi-SUN Alliance: PHY Working Group (PHYWG) Wi-SUN PHY Specification Revision 1V02

LoRaWAN 1.0.3 LoRaWAN® Specification v1.0.3 https://lora-alliance.org/resource-hub/lorawanr-specification-v103

The following RFCs are available online from the Internet Engineering Task Force (IETF):

http://www.ietf.org/rfc/std-index.txt, http://www.ietf.org/rfc/

IETF STD 51 The Point-to-Point Protocol (PPP), 1994. (Also RFC 1661, RFC 1662)

RFC 768 User Datagram Protocol

RFC 791 Internet Protocol (Also: IETF STD 0005), 1981

RFC 793 Transmission Control Protco

RFC 1144 Compressing TCP/IP Headers for Low-Speed Serial Links, 1990

RFC 1213 Management Information Base for Network Management of TCP/IP-based internets: MIB-II

RFC 1332 The PPP Internet Protocol Control Protocol (IPCP), 1992, Updated by: RFC 3241. Obsoletes: RFC 1172

RFC 1570 PPP LCP Extensions, 1994

RFC 1661 The Point-to-Point Protocol (PPP) (Also: IETF STD 0051), 1994, Updated by: RFC 2153, Obsoletes: RFC 1548

RFC 1662 PPP in HDLC-like Framing, (Also: IETF STD 0051), 1994, Obsoletes: RFC 1549

RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP), 1996. Obsoletes: RFC 1334

RFC 2433 PPP CHAP Extension, 1998

RFC 2460 Internet Protocol, Version 6

RFC 2474 Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers, 1998

RFC 2507 IP Header Compression, 1999

RFC 2508 Compressing IP/UDP/RTP Headers for Low-Speed Serial Links, 1999

RFC 2759 Microsoft PPP CHAP Extensions, Version 2, 2000

RFC 2986 PKCS #10 v1.7: Certification Request Syntax Standard

RFC 3095 RObust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed, 2001

RFC 3241 Robust Header Compression (ROHC) over PPP, 2002. Updates: RFC1332

RFC 3315 Dynamic Host Configuration Protocol for IPv6 (DHCPv6)

RFC 3513 Internet Protocol Version 6 (IPv6) Addressing Architecture, 2003

RFC 3544 IP Header Compression over PPP, 2003

RFC 3748 Extensible Authentication Protocol (EAP), 2004

RFC 4291 IP Version 6 Addressing Architecture

RFC 4443, Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification

RFC 4944 Transmission of IPv6 Packets over IEEE 802.15.4 Networks

RFC 4861 Neighbor Discovery for IP version 6 (IPv6), 2007

RFC 4944 Internet Engineering Task Force (IETF). RFC 4944: Transmission of IPv6 Packets over IEEE 802.15.4 Networks [online]. Edited by G. Montenegro, N. Kushalnagar and D. Culler. September 2007

RFC 5216 The EAP-TLS Authentication Protocol

RFC 5280 Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile, 2008

RFC 5905 Network Time Protocol Version 4: Protocol and Algorithms Specification, 2010.

RFC 6206 The Trickle Algorithm

RFC 6282 Internet Engineering Task Force (IETF). RFC 6282: Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks [online]. Edited by J. Hui, Ed. September 2011

RFC 6550 RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks

RFC 6775 Neighbor Discovery Optimization for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs), 2012

RFC 7731 Multicast Protocol for Low-Power and Lossy Networks (MPL)

RFC 7774 Multicast Protocol for Low-Power and Lossy Networks (MPL), Parameter Configuration Option for DHCPv6

Point-to-Point (PPP) Protocol Field Assignments. Online database. Available from: http://www.iana.org/assignments/ppp-numbers/ppp-numbers.xhtml

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and definitions related to the Image transfer process (see 4.4.6)

3.1.1
Image
binary data of a specified size

Note 1 to entry: An Image can be seen as a container. It may consist of one or multiple elements (image_to_activate) which are transferred, verified and activated together.

3.1.2
ImageSize
size of the whole Image to be transferred

Note 1 to entry: ImageSize is expressed in octets.

3.1.3
ImageBlock
part of the Image of size ImageBlockSize

Note 1 to entry: The Image is transferred in ImageBlocks. Each block is identified by its ImageBlockNumber.

3.1.4
ImageBlockSize
size of ImageBlock expressed in octets

3.1.5
ImageBlockNumber
identifier of an ImageBlock. ImageBlocks are numbered sequentially, starting from 0

The meaning of the definitions above is illustrated in Figure 2.

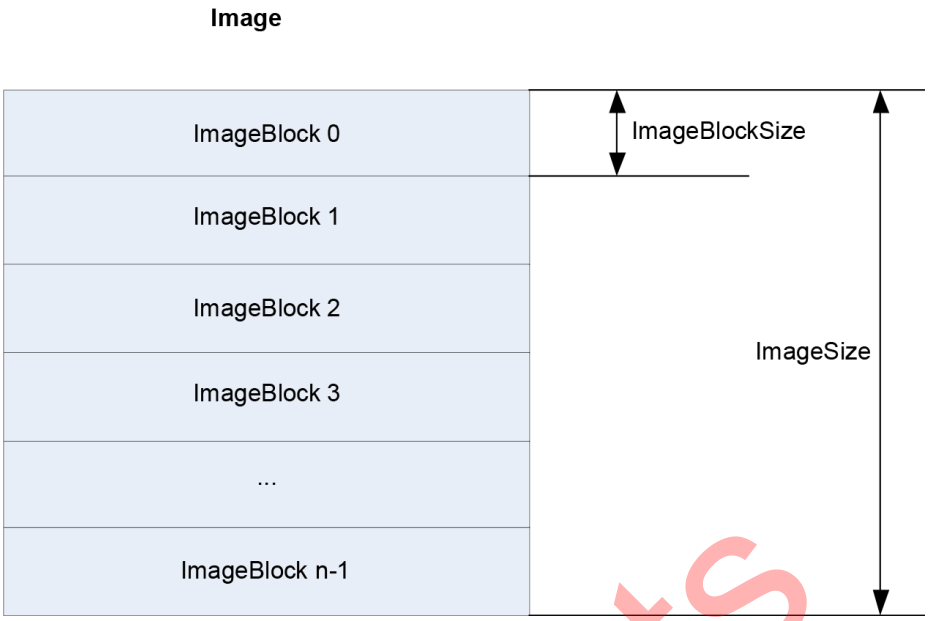

Figure 2 – The meaning of the definitions concerning the Image

3.2 Terms and definitions related to the S-FSK PLC setup classes (see 4.10)

3.2.1
initiator
user-element of a client System Management Application Entity (SMAE)

Note 1 to entry: The initiator uses the CIASE and xDLMS ASE and is identified by its system title.

[SOURCE: IEC 61334-4-511:2000, 3.8.1]

3.2.2
active initiator
initiator which issues or has last issued a CIASE Register request when the server is in the unconfigured state

[SOURCE: IEC 61334-4-511:2000, 3.9.1]

3.2.3
new system
server system which is in the unconfigured state: its MAC address equals "NEW-address"

[SOURCE: IEC 61334-4-511:2000, 3.9.3]

3.2.4
new system title
system-title of a new system

Note 1 to entry: This is the system title of a system, which is in the new state.

[SOURCE: IEC 61334-4-511:2000, 3.9.4]

3.2.5
registered system
server system which has an individual valid MAC address (therefore, different from "NEW Address", see IEC 61334-5-1:2001: Medium Access Control)

[SOURCE: IEC 61334-4-511:2000, 3.9.5]

3.2.6
reporting system
server system which issues a DiscoverReport

[SOURCE: IEC 61334-4-511:2000, 3.9.6, modified to correct an error in IEC 61334-4-511]

3.2.7
sub-slot
time needed to transmit two bytes by the physical layer

Note 1 to entry: Timeslots are divided to sub-slots in the RepeaterCall mode of the physical layer.

3.2.8
timeslot
time needed to transmit a physical frame

Note 1 to entry: As specified in IEC 61334-5-1:2001, 3.3.1, a physical frame comprises 2 bytes preamble, 2 bytes start subframe delimiter, 38 bytes PSDU and 3 bytes pause.

3.3 Terms and definitions related to the PRIME NB OFDM PLC setup ICs (see 4.12)

Definitions related to the physical layer

3.3.1
base node
the master node, which controls and manages the resources of a subnetwork

[SOURCE: ITU-T G.9904:2012, 3.2.1]

3.3.2
beacon slot
the location of the beacon PDU within a frame

[SOURCE: ITU-T G.9904:2012, 3.2.2]

3.3.3
node
any one element of a subnetwork, which is able to transmit to and receive from other subnetwork elements

[SOURCE: ITU-T G.9904:2012, 3.2.9]

3.3.4
registration
the process by which a service node is accepted as member of the subnetwork and allocated a LNID

[SOURCE: ITU-T G.9904:2012, 3.2.12]

3.3.5
service node
any one node of a subnetwork, which is not a base node

[SOURCE: ITU-T G.9904:2012, 3.2.13]

3.3.6
subnetwork
a set of elements that can communicate by complying with this specification and share a single base node

[SOURCE: ITU-T G.9904:2012, 3.2.15]

Definitions related to the MAC layer

3.3.7
disconnected state <of a service node>
this is the initial functional state for all service nodes. When disconnected, a service node is not able to communicate data or switch other nodes' data; its main function is to search for a subnetwork within its reach and try to register on it

[SOURCE: ITU-T G.9904:2012, 8.1]

3.3.8
terminal state <of a service node>
when in this functional state a service node is able to establish connections and communicate data, but it is not able to switch other nodes' data

[SOURCE: ITU-T G.9904:2012 8.1]

3.3.9
switch state <of a service node>
when in this functional state a service node is able to perform all Terminal functions. Additionally, it is able to forward data to and from other nodes in the same subnetwork. It is a branch point on the tree structure

[SOURCE: ITU-T G.9904:2012, 8.1]

3.3.10
promotion
the process by which a service node is qualified to switch (repeat, forward) data traffic from other nodes and act as a branch point on the subnetwork tree structure. A successful promotion represents the transition between Terminal and Switch state. When a service node is in the Disconnected state, it cannot directly transition to Switch state

[SOURCE: ITU-T G.9904:2012, 8.1]

3.3.11
demotion
the process by which a service node ceases to be a branch point on the subnetwork tree structure. A successful demotion represents the transition between Switch and Terminal state

[SOURCE: ITU-T G.9904:2012, 8.1]

3.4 Terms and definitions related to the ISO/IEC 14908 setup ICs (see 4.19)

3.4.1
domain
logical network that is a unit for addressing

Note 1 to entry: Subnet (see below) and node addresses are assigned by the administrator responsible for the domain, and they have meaning only in the context of that domain.

Note 2 to entry: All nodes must be in the same domain to be able to address each other.

3.4.2
node
abstraction for a physical node that represents the highest degree of address resolvability on a network

Note 1 to entry: A node is identified (addressed) within a subnet by its (logical) node identifier. A physical node may belong to more than one subnet; when it does, it is assigned one (logical) node number for each subnet to which it belongs. A physical node may belong to at most two subnets; these subnets must be in different domains. A node may also be identified (absolutely) within a network by its Unique_Node_ID.

3.4.3
subnet
set of nodes accessible through the same link layer protocol

3.4.4
transaction
sequence of messages that are correlated together

3.5 Terms and definitions related to ZigBee® (see 4.15)

NOTE Terms marked with * are from the ZigBee® Specification.

3.5.1
CAD
Consumer Access Device; a ZigBee® gateway device that acts like an IHD within the ZigBee® network, but has an additional connection to a different network (i.e. WiFi)

3.5.2
IHD
in Home Display; a device that has a screen for the displaying of Energy information to the consumer

3.5.3
install code
a Hashed (via MMO) Pre-Configured Linked Key (PCLK) that is provided to a Trust Center via out-of-band communications. A new device wishing to join the network would need to send this install code to the Trust Center, which would allow the Trust Center to execute the joining process, using this install code as part of the security information

3.5.4
link key *
this is a key that is shared exclusively between two, and only two, peer application-layer entities within a PAN

3.5.5
MAC address/IEEE address
these are used synonymously to represent the EUI-64 code allocated to the ZigBee® Radio

3.5.6
ZigBee®
ZigBee® is a specification for a suite of high level communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee® is based on an IEEE 802.15 standard. Though low-powered, ZigBee® devices often transmit data over longer distances by passing data through intermediate devices to reach more distant ones, creating a mesh network

3.5.7
ZigBee® client
this is similar to the role of the DLMS client. For a greater understanding of the interaction between the client and server the ZigBee® PRO specification should be read

3.5.8
ZigBee® coordinator *
an IEEE 802.15.4-2003 PAN coordinator that is the principal controller of an IEEE 802.15.4-2003-based network that is responsible for network formation. The PAN coordinator must be a full function device (FFD)

3.5.9
ZigBee® cluster
a set of message types related to a certain device function (e.g. metering, ballast control)

3.5.10
ZigBee® mirror
a device which echoes data being published by a battery operated ZigBee® device, allowing other network actors to obtain data while the battery operated device is unavailable due to power saving

3.5.11
ZigBee® PRO
an alternative name for the ZigBee® 2007 protocol. ZigBee® 2007, now the current stack release, contains two stack profiles, stack profile 1 (simply called ZigBee®), for home and light commercial use, and stack profile 2 (called ZigBee® PRO). ZigBee® PRO offers more features, such as multi-casting, many-to-one routing and high security with Symmetric-Key Key Exchange (SKKE), while ZigBee® (stack profile 1) offers a smaller footprint in RAM and flash. Both offer full mesh networking and work with all ZigBee® application profiles

3.5.12
ZigBee® router *
an IEEE 802.15.4-2003 FFD participating in a ZigBee® network, which is not the ZigBee® coordinator but may act as an IEEE 802.15.4-2003 coordinator within its personal operating space, that is capable of routing messages between devices and supporting associations

3.5.13
ZigBee® server
this is similar to the role of the DLMS server

Note 1 to entry: For a greater understanding of the interaction between the client and server the ZigBee® PRO specification should be read.

3.5.14
ZigBee® Trust Center *
the device trusted by devices within a ZigBee® network to distribute keys for the purpose of network and end-to-end application configuration management

3.6 Terms and definitions related to Payment metering interface classes (see 4.6)

3.6.1
account
statement of the credits and charges of an individual with reference to a contractual relationship between the said individual and another party; in this case a utility service provider

3.6.2
available
(credit), total value that may be decremented by charges without further action

3.6.3
charge
representation of a financial liability on an account

Note 1 to entry: Within this specification charges are modelled in the form of “Charge” objects that define the amount due, collection mechanism, collection periodicity, collection amount and other relevant variables.

Note 2 to entry: There may be one or more instalments payable and their size may be determined explicitly or in terms of a rate of payment per unit of time or of consumption.

Note 3 to entry: Charges may also be levied as a fixed amount per vend.

3.6.4
credit mode
mode of operation of a meter in a payment system that does not require payment for the consumption in advance

3.6.5
collect
take payment of an instalment of a charge, accounting for the collection amount determined by the *unit_charge_active* attribute of the “Charge” object

3.6.6
commodity
utility product delivered to a consumer at a service point on their premises under a contract of supply such as electricity, gas, water, and heat

3.6.7
enabled
when used in the context of “Credit” or “Charge” types; means that the “Credit” or “Charge” type appears in the *credit_reference_list* or *charge_reference_list* respectively of the “Account” object

3.6.8
emergency credit
amount of credit administered in a payment metering system working in prepayment mode, representing a short term loan to the consumer

Note 1 to entry: This is a feature of some payment metering systems in which the consumer is able to obtain a limited amount of credit as a short-term loan, often mediated locally by the prepayment unit itself. The word “emergency” indicates urgent need rather than disaster.

3.6.9
Enterprise Resource Planning (ERP) system
Back Office System
computer system carrying out the business processing of an organisation (such as an energy supplier), as distinct from the communications system. See also Head End System

3.6.10
friendly credit
period of time with a configurable start and end point, where the meter will not disconnect supply regardless of the status of the *available_credit*. Also known as non-disconnect period

Note 1 to entry: This function is used in circumstances where it would be inconvenient to obtain needed credit (for example, at night or in the case of a frail elderly consumer).

3.6.11
Head End System
HES
computer system, connected by a communications network to a population of intelligent devices, whose job is the control and coordination of information flows to and from those devices, typically on behalf of a separate ERP (“back office”) system

3.6.12
Home Area Network
HAN
communications network constructed with the principal aim of connecting devices in one premises

3.6.13
in use
state of a “Credit” object that, at the point of query, has a positive *current_credit_amount* and that Credit is being consumed by some active Charges represented by “Charge” objects

Note 1 to entry: When the current_credit_amount reaches zero, the credit status becomes exhausted.

3.6.14
load limiting
mode of operation of some payment metering systems (not necessarily in prepayment mode) in which the consumer is able to draw on a supply provided they do not exceed a configured level of demand

Note 1 to entry: The implied purpose is for management of the consumer’s finances: where demand is subject to limitation for the benefit of the generation or distribution system the term “load management” is more often used.

3.6.15
local communications
mechanism of communicating with the meter over some media, within the vicinity of that meter such as over a HAN or optical port

3.6.16
manual entry
entering of a token to the payment metering installation via means of a manual process

3.6.17
managed payment mode
specialisation of credit mode that allows operation of an Account, Credit and possibly Charges in a meter where the payment for the service is received by the utility after the service has been consumed

Note 1 to entry: When in managed payment mode tokens are not normally used, however the credit is adjusted using the methods in the “Credit” object.

Note 2 to entry: The meter is allowed to go into an allowable amount of debt before being credited from the client in line with a received cash payment by the utility.

Note 3 to entry: In this example cash is used as a generic term for a real life payment of currency to the utility which could be executed as legal tender, automated electronic transfer, etc.

3.6.18
payment metering installation
set of payment metering equipment installed and ready for use at a consumer's premise

Note 1 to entry: This includes mounting the equipment as appropriate, and where a multi-device installation is involved, the connection of each unit of equipment as appropriate. It also includes the connection of utility supply network to each supply interface, the connection of the consumer's load interface, and the commissioning of the equipment into an operational state as a payment metering installation.

3.6.19
prepayment mode
mode of operation of a meter in a payment system, whereby the consumer pays for service in advance of consumption

3.6.20
post-payment
method of operation of a payment system whereby a consumer may consume service before paying for it

Note 1 to entry: This term can be used interchangeably with the term Credit mode when used in the context of operational modes.

Note 2 to entry: This term is usually used in conjunction with a system description whereas Credit mode is used when referring to the operational mode of a meter or account.

3.6.21
remote communications
transportation of a token or other message from a client to a server running a payment metering application process via some form of WAN and access network. This could be point to point, mesh radio, fibre optic connection, etc., and may travel through multiple devices and over multiple protocols before reaching the meter

3.6.22
repayable
credit_types such as emergency credit where an amount added to *current_credit_amount* of a "Credit" object has to be repaid before the Credit is selectable again

3.6.23
reserved credit
amount of credit that is held in reserve in the account of a payment meter, for use at a later time, at the discretion of the consumer

Note 1 to entry: The mechanism for reserving this credit may be subject to agreement between the utility supplier and the consumer. For example a proportion of every token may be added to the reserve Credit or the supplier might give the consumer an allowance every month, but these arrangements will be project specific.

3.6.24
selectable
specific state of a "Credit" object where the consumer's immediate confirmation is needed before it can be brought into use

Note 1 to entry: For example, Emergency Credit has the nature of a short-term loan and should therefore only be deployed with the consumer's agreement. The term refers respectively to the need to get agreement and to the fact of having received agreement. Only a "Credit" made (1) Selectable can be (2) Selected / Invoked. Not all Credits need to be selected by an external trigger, as in most cases the meter application automatically performs this action.

3.6.25
selected/invoked
specific state of a “Credit” object where the value of *current_credit_amount* is included in the calculation of *available_credit* in the related “Account”

Note 1 to entry: This is the state of a Credit before becoming In use and is considered in the available_credit attribute of the “Account”, but is not yet being consumed by any Charge (due to a higher priority Credit being In use.

3.6.26
service
provision of a commodity (such as water, electricity gas or heat)

3.6.27
social credit
credit that is given free of payment for reasons such as the relief of poverty

Note 1 to entry: Typically such a credit is given at fixed times (e.g. monthly) in limited amounts. This particular type of credit could also be consumption based, such that that the consumer must keep consumption below a limiting threshold in order to use the social credit. This could be controlled by the consumer being disconnected if the limit is breached.

Note 2 to entry: Social credits are modelled of “Credit” objects of type emergency_credit, time_based_credit, consumption_based_credit.

3.6.28
temporary debt
transient liability to the meter that accrues when *Charges* are collected at a time when all credits are exhausted

Note 1 to entry: This temporary debt amount is accumulated in amount_to_clear in the “Account” object.

3.6.29
token
self-contained package of data related to the purchase of credit or to other system functions, embodied in a token carrier (q.v.). The token forms a link between source and destination of the transaction. The token contents may reflect money, energy, time, etc., in harmony with the currency declared in the meter

Note 1 to entry: Defined in IEC TR 62055-21:2005 as “<Equipment-related definition>[sic] information content including an instruction issued on a token carrier by a vending or management system that is capable of subsequent transfer to and acceptance by a specific payment meter, or one of a group of meters, with appropriate security”.

3.6.30
token carrier
means of transferring a token from one system element to another, typically in material “physical” or electronic “virtual” form

Note 1 to entry: In a general sense, the token refers to the instruction and information being transferred, while the token carrier refers to the physical device being used to carry the instruction and information, or to the communications medium in the case of a virtual token carrier.

3.6.31
token carrier interface
interface between the token carrier and the payment metering installation

Note 1 to entry: For example, it may be a keypad for numeric tokens, or a physical token carrier acceptor, or a communications connection to a local or remote machine for a virtual token carrier interface.

Note 2 to entry: The token carrier interface may also be used to pass additional information to or from the payment meter, such as for the purposes of payment system management.

3.6.32
top-up
credit token
credit purchased by the consumer and capable of being delivered in the form of a token (as well as by other means) in a physical or virtual token carrier

3.6.33
vend
operation or transaction resulting in the available credit held on a payment meter to be increased by use of a credit token

Note 1 to entry: Vend would normally relate to a transaction in conjunction with a vending system at a point of sale, resulting in the creation of a token that can be transported by means of a physical or virtual token carrier.

3.7 Terms and definitions related to the Arbitrator IC (see 4.5.12)

3.7.1
action
operation that can be requested locally or remotely from the server

3.7.2
actor
entity requesting an action

Note 1 to entry: It can be the local application process or a client.

3.7.3
arbitrator
function modelled in COSEM that can determine, based on pre-configured rules, which action is carried out when multiple actors request potentially conflicting actions to control the same resource

3.8 Abbreviated terms

Abbreviation	Explanation
3GPP	3rd Generation Partnership Project
6LoWPAN	IPv6 over Low-Power Wireless Personal Area Network
AA	Application Association
ABP	Activation by Personalisation
AARE	A-Associate Response – an APDU of the ACSE
AARQ	A-Associate Request – an APDU of the ACSE
ACSE	Association Control Service Element
ADD	Automated Device Discovery
APDU	Application layer protocol data unit
ADP	Primary Station Address
ADS	Secondary Station Address
AGA	American Gas Association
AGA 8	Method for calculation of compressibility (Gas metering)
AGC	Automatic Gain Control
AL	Application layer
AP	Application process
APDU	Application Protocol Data Unit

Abbreviation	Explanation
APS	Application Support Sublayer (ZigBee® term)
ARFCN	Absolute radio-frequency channel number
ASE	Application Service Element
ATM	Automated Topology Management
A-XDR	Adapted Extended Data Representation (IEC 61334-6)
base_name	The short_name corresponding to the first attribute (“logical_name”) of a COSEM object
BCD	Binary Coded Decimal
BER	Bit Error Rate
CBCP	CallBack Control Protocol (PPP)
CC	Current Credit (S-FSK PLC profile)
CDMA	Code Division Multiple Access
CENELEC	European Committee for Electrotechnical Standardization
CHAP	Challenge Handshake Authentication Protocol
CIASE	Configuration Initiation Application Service Element (S-FSK PLC profile)
class_id	Interface class identification code
CLI	Calling Line Identity
COSEM	Comprehensive Semantic Model for Energy Management
COSEM object	An instance of a COSEM interface class
CPAS	Common Part Adaptation Sublayer
CRC	Cyclic Redundancy Check
CSAP	Client Service Access Point
CSD	Circuit Switched Data
CSMA	Carrier Sense Multiple Access
CtoS	Client to Server challenge
CU	Currently Unused
DC	Delta credit (S-FSK PLC profile)
DC	Data concentrator
DevAddr	(Related to LoRaWAN) A 32-bit non-unique identifier assigned to an end-device statically or dynamically after a Join Procedure (depending on the activation mode)
DHCP	Dynamic Host Configuration Protocol
DIB	Data Information Block (M-Bus)
DIF	Data Information Field (M-Bus)
DL	Data Link
DLMS	Device Language Message Specification
DLMS UA	DLMS User Association
DLPDU	Data Link Protocol Data Unit
DNS	Domain Name Server
DSCP	Differentiated Services Code Point
DSSID	Direct Switch ID
EAP	Extensible Authentication Protocol
EARFCN	Enhanced Absolute radio-frequency channel number
EDGE	Enhanced Data rates for GSM Evolution

Abbreviation	Explanation
EMC	Emergency Credit (in relation to payment metering)
ERP	Enterprise Resource Planning
EUI-48	48-bit Extended Unique Identifier
EUI-64	64-bit Extended Unique Identifier
E-UTRA	Evolved UMTS Terrestrial Radio Access
FCC	Federal Communications Commission
FFD	Full-Function Device
FIFO	First-In-First-Out
F/R	Fragmentation and Reassembly
FTP	File Transfer Protocol
GCM	Galois/Counter Mode, an algorithm for authenticated encryption with associated data
GMT	Greenwich Mean Time. Replaced by Coordinated Universal Time (UTC).
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HAN	Home Area Network
HART	Highway Addressable Remote Transducer see http://www.hartcomm.org/ (in relation with the Sensor manager interface class)
HDLC	High-level Data Link Control
HES	Head End System
HHT	Hand Held Terminal
HLS	High Level Security Authentication
HSDPA	High-Speed Downlink Packet Access
HS-PLC	High-Speed Power Line Carrier
IANA	Internet Assigned Numbers Authority
IB	Information Base
IC	Interface Class (COSEM)
IC	Initial credit (S-FSK PLC profile)
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IPCP	Internet Protocol Control Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standardization
ISP	Internet Service Provider
IT	Information Technology
ITU-T	International Telecommunication Union – Telecommunication
KEK	Key Encryption Key
LA	Local Area
LAC	Local Area Code
LAN	Local Area Network

Abbreviation	Explanation
LBD	(6)LoWPAN Bootstrapping Device
LCID	Local Connection Identifier
LCP	Link Control Protocol
LDN	Logical Device Name
LLC	Logical Link Control (sublayer)
LLS	Low Level Security
LN	Logical Name
LNID	Local Node Identifier
LOADng	6LoWPAN Ad Hoc On-Demand Distance Vector Routing Next Generation (LOADng)
LQI	Link Quality Indicator (ZigBee ® term)
LSB	Least Significant Bit
LSID	Local Switch Identifier
LTE	Long Term Evolution (Wireless communication)
M	mandatory
M2M	Machine to Machine
MAC	Medium Access Control
M-Bus	Meter Bus
MCC	Mobile Country Code
MD5	Message Digest Algorithm 5
MIB	Management Information Base (S-FSK PLC profile)
MID	Measuring Instruments Directive 2004/22/EC of the European Parliament and of the Council
MMO	Matyas-Meyer-Oseas hash (ZigBee ® term)
MNC	Mobile Network Code
MPAN	(UK term) Meter Point Access Number – reference of the location of the Electricity meter on the electricity distribution network.
MPDU	MAC Protocol Data Unit
MSB	Most Significant Bit
MSDU	MAC Service Data Unit
MT	Mobile Termination
NB	Narrow-band
ND	Neighbour Discovery
NRSRP	Narrowband Reference Signal Received Power
NRSRQ	Narrowband Reference Signal Received Quality
NTP	Network Time Protocol
o	optional
OBIS	OBject Identification System
OFDM	Orthogonal Frequency Division Multiplexing
OTA	Over the Air – Refers to Firmware Upgrade using ZigBee ®
PAN	Personal Area Network (Term used in relation to G3-PLC [1]) and ZigBee ®
Pad	Padding
PAP	Password Authentication Protocol
PCLK	Pre-Configured Link Key (ZigBee® term)

Abbreviation	Explanation
PDU	Protocol Data Unit
PhL, PHY	Physical Layer
PIB	PLC Information Base
PID	Program Identifier
PIN	Personal Identity Number
PLC	Power Line Carrier
PLMN	Public Land Mobile Network
PNPDU	Promotion Needed PDU
POS	Point Of Sale (Payment metering)
POS	Personal Operating Space (ZigBee ®)
PPDU	Physical Protocol Data Unit
PPP	Point-to-Point Protocol
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RB	Radio Band
REJ PDU	Reject Protocol Data Unit
RFC	Request for Comments; a document published by the Internet Engineering Task Force
RFD	Reduced Function Device
ROHC	Robust Header Compression
RREP	Route Reply
RREQ	Route Request
RRER	Route Error
RSRQ	Reference Signal Received Quality
RSRP	Reference Signal Received Power
RSSI	Received Signal Strength Indication (ZigBee® term)
SAP	Service Access Point
SAS	Startup Attribute Set (ZigBee® term)
SCP	Shared Contention Period
SDU	Service Data Unit
SE	Smart Energy
SEP	Smart Energy Profile (ZigBee® term)
S-FSK	Spread – Frequency Shift Keying
SHA	Secure Hash Algorithm
SI	International System of Units (*Système International d'Unités*)
SID	Switch identifier
SITP	Secure Information Transfer Protocol
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SN	Short Name
SNA	Subnetwork Address
SSAS	Service Specific Adaptation Sublayer
SSCS	Service Specific Convergence Layer

Abbreviation	Explanation
StoC	Server to Client Challenge
TAB	In the case of the EURIDIS profiles without DLMS and without DLMS/COSEM: data code. In the case of profiles using DLMS or DLMS/COSEM: value at which the equipment is programmed for Discovery
TABi	List of TAB field
TCC	Transmission Control Code (IPv4)
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
TOU	Time of use
TTL	Time To Live
UDP	User Datagram Protocol
UMTS	Universal Mobile Telecommunications System
UNC	Unconfigured (S-FSK PLC profile)
UTC	Coordinated Universal Time
VIB	Value Information Block (M-Bus)
VIF	Value Information Field (M-Bus)
VZ	Billing period counter (Form *Vorwertzähler* in German, see DIN 43863-3)
wake-up	trigger the meter to connect to the communication network to be available to a client (e.g. HES)
WAN	Wide Area Network
wM-Bus	Wireless M-Bus
ZTC	ZigBee® Trust Center
[1)] In the case of the G3-PLC technology, PAN may be defined as PLC Area Network.	

4 The COSEM interface classes

4.1 Basic principles

4.1.1 General

This Clause 4.1 describes the basic principles on which the COSEM interface classes (ICs) are built. It also gives a short overview on how interface objects – instantiations of the ICs – are used for communication purposes. Data collection systems, metering equipment, and more generally, devices for energy measurement, control and management from different vendors, following these specifications, can exchange data in an interoperable way.

For specification purposes, this standard uses the technique of object modelling.

An object is a collection of attributes and methods. Attributes represent the characteristics of an object. The value of an attribute may affect the behaviour of an object. The first attribute of any object is the *logical_name*. It is one part of the identification of the object. An object may offer a number of methods to either examine or modify the values of the attributes.

Objects that share common characteristics are generalized as an interface class, identified with a class_id. Within a specific IC, the common characteristics (attributes and methods) are described once for all objects. Instantiations of ICs are called COSEM interface objects.

Manufacturers may add proprietary methods and attributes to any object; see 4.1.2.

Figure 3 illustrates these terms by means of an example:

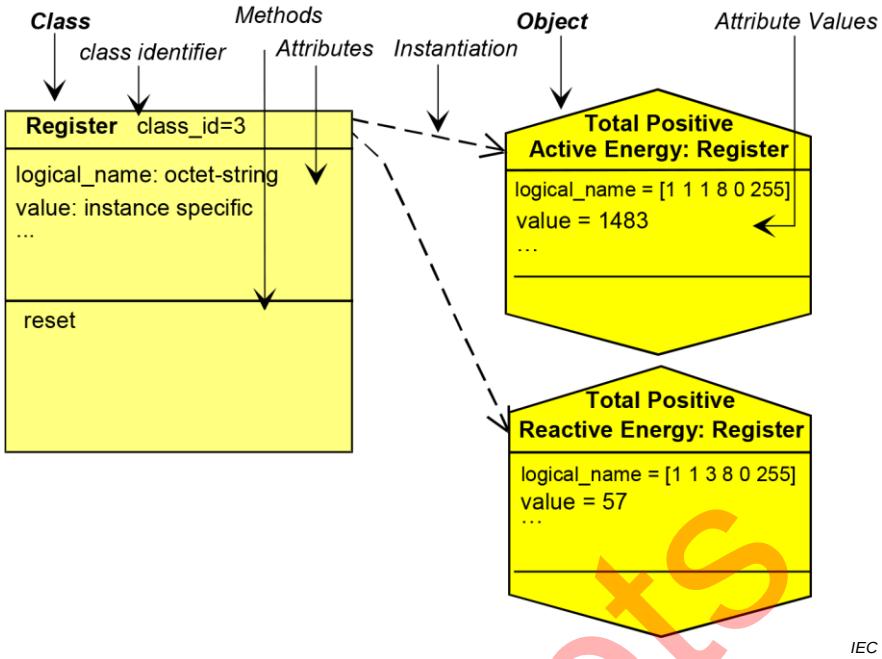

Figure 3 – An interface class and its instances

The IC "Register" is formed by combining the features necessary to model the behaviour of a generic register (containing measured or static information) as seen from the client (data collection system, hand held terminal). The contents of the register are identified by the attribute *logical_name*. The *logical_name* contains an OBIS identifier (see DLMS UA 1000-1 Ed 17 Part 1:2025. The actual (dynamic) content of the register is carried by its *value* attribute.

Defining a specific meter means defining several specific objects. In the example of Figure 3, the meter contains two registers; i.e. two specific instances of the IC "Register" are instantiated. Through the instantiation, one COSEM object becomes a "total, positive, active energy register" whereas the other becomes a "total, positive, reactive energy register".

NOTE The COSEM interface objects (instances of COSEM ICs) represent the behaviour of the meter as seen from the "outside". Therefore, modifying the value of an attribute – for example resetting the *value* attribute of a register – is always initiated from the outside. Internally initiated changes of the attributes – for example updating the *value* attribute of a register – are not described in this model.

4.1.2 Referencing methods

Attributes and methods of COSEM objects can be referenced in two different ways:

Using logical names (LN referencing): In this case, the attributes and methods are referenced via the identifier of the COSEM object instance to which they belong.

The reference for an attribute is: class_id, value of the *logical_name* attribute, attribute_index.

The reference for a method is: class_id, value of the *logical_name* attribute, method_index, where:

– attribute_index is used as the identifier of the attribute required. Attribute indexes are specified in the definition of each IC. They are positive numbers starting with 1. Proprietary attributes may be added: these shall be identified with negative numbers;

– method_index is used as the identifier of the method required. Method indexes are specified in the definition of each IC. They are positive numbers starting with 1. Proprietary methods may be added: these shall be identified with negative numbers.

Using short names (SN referencing): This kind of referencing is intended for use in simple devices. In this case, each attribute and method of a COSEM object is identified with a 13-bit integer. The syntax for the short name is the same as the syntax of the name of a DLMS named variable. See IEC 61334-4-41:1996 and DLMS UA 1000-2 Ed.11:2021, 9.5.

4.1.3 Reserved base_names for special COSEM objects

In order to facilitate access to devices using SN referencing, some short_names are reserved as base_names for special COSEM objects. The range for reserved base_names is from 0xFA00 to 0xFFF8. The following specific base_names are defined, see Table 1.

Table 1 – Reserved base_names for SN referencing

Base_name (objectName)	COSEM object
0xFA00	Association SN
0xFB00	Script table (instantiation: Broadcast “Script table”)
0xFC00	SAP assignment
0xFD00	“Data” or “Register” object containing the “COSEM logical device name” in the attribute "value"

4.1.4 Class description notation

4.1.4.1 Overview

This subclause 4.1.4 describes the notation used to define the ICs.

A short text describes the functionality and application of the IC. Table 2 provides an overview of the IC including the class name, the attributes, and the methods. Each attribute and method shall be described in detail. The template is shown in Table 2.

Table 2 – Interface class overview

Class name		**Cardinality**	**class_id, version**			
Attributes		***Data type***	***Min.***	***Max.***	***Def.***	**Short name**
1. logical_name	(static)	octet-string				x
2. …	(…)	…				x + 0x…
3. …	(…)	…				x + 0x…
Specific methods (if required)		***m/o***				
1.		…				x + 0x…
2.		…				x + 0x…
3.		…				x + 0x…

4.1.4.2 Class name

Describes the interface class (e.g. “Register”, “Clock”, “Profile generic”...).

NOTE Interface classes names are mentioned in quotation marks.

4.1.4.3 Cardinality

Specifies the number of instances of the IC within a logical device (see 4.1.8).

value The IC shall be instantiated exactly “value” times.

min...max. The IC shall be instantiated at least “min.” times and at most “max.” times. If min. is zero (0) then the IC is optional, otherwise (min. > 0) "min." instantiations of the IC are mandatory.

4.1.4.4 class_id

Identification code of the IC (range 0 to 65 535). The class_id of each object is retrieved together with the logical name by reading the object_list attribute of an “Association LN” / ”Association SN” object.

– class_id-s from 0 to 8 191 are reserved to be specified by the DLMS UA.
– class_id-s from 8 192 to 32 767 are reserved for manufacturer specific ICs.
– class_id-s from 32 768 to 65 535 are reserved for user group specific ICs.

The DLMS UA reserves the right to assign ranges to individual manufacturers or user groups.

class_id-s 32768 to 32845 are allocated to DKE.

class_id-s 32850 to 32860 are allocated to the STS Association.

4.1.4.5 version

Identification code of the version of the IC. The version of each object is retrieved together with the class_id and the logical name by reading the object_list attribute of an “Association LN” / ”Association SN” object.

Within one logical device, all instances of a certain IC shall be of the same version.

Version numbers are to be allocated by the DLMS User Association.

4.1.4.6 Attributes

Specifies the attributes that belong to the IC.

(dyn.) Classifies an attribute that carries a process value, which is updated by the meter itself.

(static) Classifies an attribute, which is not updated by the meter itself (for example configuration data).

There are some attributes which may be either static or dynamic depending on the application. In these cases this property is not indicated.

Attribute names use the underscore notation. When mentioned in the text they are in *italic*. Example: *logical_name.*

4.1.4.7 logical_name

octet-string It is always the first attribute of an IC. It identifies the instantiation (COSEM object) of this IC. The value of the *logical_name* conforms to OBIS; see Clauses 6 and DLMS UA 1000-1 Ed 17 Part 1:2025.

4.1.4.8 Data type

Defines the data type of an attribute; see 4.1.5.

4.1.4.9 Min.

Specifies if the attribute has a minimum value.

X The attribute has a minimum value.

<*empty*> The attribute has no minimum value.

4.1.4.10 Max.

Defines if the attribute has a maximum value.

X The attribute has a maximum value.

<*empty*> The attribute has no maximum value.

4.1.4.11 Def.

Specifies if the attribute has a default value. This is the value of the attribute after reset.

X The attribute has a default value.

<*empty*> The default value is not defined by the IC specification.

4.1.4.12 Short name

When Short Name (SN) referencing is used, each attribute and method of object instances has to be mapped to short names.

The base_name x of each object instance is the DLMS named variable the logical name attribute is mapped to. It is selected in the implementation phase. The IC definition specifies the offsets for the other attributes and for the methods.

4.1.4.13 Specific methods

Provides a list of the specific methods that belong to the object.

Method Name () The method has to be described in the subsection "Method description".

NOTE Method names use the underscore notation. When mentioned in the text they are in *italic*. Example: *add_object*.

4.1.4.14 m/o

Defines if the method is mandatory or optional.

m (mandatory)	The method is mandatory.
o (optional)	The method is optional.

4.1.4.15 Attribute description

Describes each attribute with its data type (if the data type is not simple), its data format and its properties (minimum, maximum and default values).

4.1.4.16 Method description

Describes each method and the invoked behaviour of the COSEM object(s) instantiated.

NOTE Services for accessing attributes or methods by the protocol are specified DLMS UA 1000-2 Ed.11:2021, Clause 9.

4.1.4.17 Selective access

The xDLMS attribute-related services typically reference the entire attribute. However, for certain attributes selective access to just a part of the attribute may be provided. The part of the attribute is identified by specific selective access parameters. These are defined as part of the attribute specification.

Selective access is available with the following interface class attributes and methods:

- “Profile generic” objects, **buffer** attribute;
- “Association SN” objects, **object_list** and **access_rights_list** attribute;
- “Association LN” objects, **object_list** attribute;
- “Compact data”, objects, **compact_buffer** attribute;
- “Push” objects, **push_object_list** attribute;
- “Data protection” objects, **protection_object_list** attribute **get_protected_attributes** method and **set_protected_attributes** method.

4.1.5 Common data types

Table 3 contains the list of data types usable for attributes of COSEM objects.

Table 3 – Common data types

Type description	Tag [a]	Definition	Value range
-- simple data types			
null-data	[0]		
boolean	[3]	boolean	TRUE or FALSE
bit-string	[4]	An ordered sequence of boolean values	
double-long	[5]	Integer32	-2 147 483 648... 2 147 483 647
double-long-unsigned	[6]	Unsigned32	0...4 294 967 295
	[7]	Tag of the “floating-point” type in IEC 61334-4-41:1996, not usable in DLMS/COSEM. See tags [23] and [24]	
octet-string	[9]	An ordered sequence of octets (8 bit bytes)	
visible-string	[10]	An ordered sequence of ASCII characters	
	[11]	Tag of the “time” type in IEC 61334-4-41:1996, not usable in DLMS/COSEM. See tag [27]	
utf8-string	[12]	An ordered sequence of characters encoded as UTF-8	
bcd	[13]	binary coded decimal	
integer	[15]	Integer8	-128...127
long	[16]	Integer16	-32 768...32 767
unsigned	[17]	Unsigned8	0...255
long-unsigned	[18]	Unsigned16	0...65 535
long64	[20]	Integer64	$-2^{63}...2^{63}-1$
long64-unsigned	[21]	Unsigned64	$0...2^{64}-1$
enum	[22]	The elements of the enumeration type are defined in the *Attribute description* or *Method description* section of a COSEM IC specification.	0...255
float32	[23]	OCTET STRING (SIZE(4))	For formatting, see 4.1.6.2.
float64	[24]	OCTET STRING (SIZE(8))	
date-time[b]	[25]	OCTET STRING SIZE(12))	For formatting, see 4.1.6.1.
date	[26]	OCTET STRING (SIZE(5))	
time	[27]	OCTET STRING (SIZE(4))	
delta-integer	[28]	Integer8	-128...127
delta-long	[29]	Integer16	-32 768...32 767
delta-double-long	[30]	Integer32	-2 147 483 648... 2 147 483 647
delta-unsigned	[31]	Unsigned8	0...255
delta-long-unsigned	[32]	Unsigned16	0...65 535
delta-double-long-unsigned	[33]	Unsigned32	0...4 294 967 295
-- complex data types			
array	[1]	The elements of the array are defined in the *Attribute* or *Method description* section of a COSEM IC specification.	

Type description	Tag [a]	Definition	Value range
structure	[2]	The elements of the structure are defined in the *Attribute or Method description* section of a COSEM IC specification.	
compact array	[19]	Provides an alternative, compact encoding of complex data.	
-- CHOICE		For some COSEM interface objects attributes, the data type may be chosen at instantiation, in the implementation phase of the COSEM server. The server always shall send back the data type and the value of each attribute, so that together with the logical name an unambiguous interpretation is ensured. The list of possible data types is defined in the “Attribute description” section of a COSEM IC specification.	
[a] The tags are as defined in DLMS UA 1000-2 Ed.11:2021, 9.5			
[b] The type-description for date-time has been harmonised as date-time throughout the document.			