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**Datenkommunikation der elektrischen Energiemessung –
DLMS/COSEM –****Teil 8-3: PLC S-FSK Spezifikation für Areal-Netze
(IEC 62056-8-3:2013);****Englische Fassung EN 62056-8-3:2013**

Electricity metering data exchange –

The DLMS/COSEM suite –

Part 8-3: Communication profile for PLC S-FSK neighbourhood networks
(IEC 62056-8-3:2013);

English version EN 62056-8-3:2013

Echange des données de comptage de l'électricité –

La suite DLMS/COSEM –

Partie 8-3: Profil de communication pour réseaux de voisinage CPL S-FSK
(CEI 62056-8-3:2013);

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Anwendungsbeginn

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Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 62056-8-3:2011-10.

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3.1 Begriffe ^{N1)}

3.1.1

Initiator

(en: initiator)

Nutzerelement einer Client-SMAE (Systemmanagement-Anwendungseinheit). Es verwendet die CIASE und xDLMS ASE und ist durch seinen Systemnamen gekennzeichnet

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

3.1.2

aktiver Initiator

(en: active initiator)

Initiator, der eine CIASE-Register-Anforderung ausgibt oder ausgegeben hat, wenn der Server sich im nicht konfigurierten Zustand befindet

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

3.1.3

neues System

(en: new system)

Serversystem, das sich im nicht konfigurierten Zustand befindet: seine MAC-Adresse ist gleich „NEW-address“

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

3.1.4

neuer Systemtitel

(en: new system title)

Systemtitel eines neuen Systems

Anmerkung 1 zum Begriff: Dies ist der Systemtitel eines neuen Systems, das sich im neuen Zustand befindet.

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

^{N1)} Nationale Fußnote: Die Nummerierung der Begriffe aus IEC 62056-9-7:2013 wurde beibehalten.

3.1.5

registriertes System

(en: registered system)

Serversystem, das eine individuelle, gültige MAC-Adresse hat

Anmerkung 1 zum Begriff: Diese MAC-Adresse ist deshalb nicht identisch mit der „NEW Address“, siehe IEC 61334-5-1: Medium Access Control.

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

3.1.6

Berichtersystem

(en: reporting system)

Serversystem, das einen Discover-Bericht ausgibt

[IEC 61334-4-511:2000, 3.9.6, modifiziert]

3.1.7

Sub-Zeitschlitz

(en: sub-timeslot)

Zeit, die zur Übertragung von 2 Byte durch die physikalische Schicht erforderlich ist

Anmerkung 1 zum Begriff: Im RepeaterCall-Modus der physikalischen Schicht werden Zeitschlitzze in Subschlitzze unterteilt.

3.1.8

Zeitschlitz

(en: timeslot)

Zeit, die zur Übertragung eines physikalischen Rahmens erforderlich ist

Anmerkung 1 zum Begriff: Wie in IEC 61334-5-1:2001, 3.3.1 festgelegt, umfasst ein physikalischer Rahmen 2 Byte Präambel, 2 Byte Start-Subrahmenbegrenzer, 38 Byte PSDU und 3 Byte Pause.

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EN 62056-8-3

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**Electricity metering data exchange –
The DLMS/COSEM suite –
Part 8-3: Communication profile for PLC S-FSK neighbourhood networks
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Energiemessung –
DLMS/COSEM –
Teil 8-3: PLC S-FSK Spezifikation für
Areal-Netze
(IEC 62056-8-3:2013)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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Foreword

The text of document 13/1526/FDIS, future edition 1 of IEC 62056-8-3, prepared by IEC/TC 13 "Electrical energy measurement, tariff- and load control" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62056-8-3:2013.

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The text of the International Standard IEC 62056-8-3:2013 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61334-4-512:2001 NOTE Harmonized as EN 61334-4-512:2002 (not modified).

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ELECTRICITY METERING DATA EXCHANGE – THE DLMS/COSEM SUITE –

Part 8-3: Communication profile for PLC S-FSK neighbourhood networks

1 Scope

This part of IEC 62056 specifies the DLMS/COSEM PLC S-SFK communication profile for neighbourhood networks.

It uses standards established by IEC TC 57 in the IEC 61334 series, *Distribution automation using distribution line carrier systems* and it specifies extensions to some of those standards.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

IEC 61334-4-1:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 1: Reference model of the communication system*

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

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/TR 62051:1999, *Electricity metering – Glossary of terms*

IEC/TR 62051-1:2004, *Electricity metering – Data exchange for meter reading, tariff and load control – Glossary of terms – Part 1: Terms related to data exchange with metering equipment using DLMS/COSEM*

IEC 62056-46:2002, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol*
Amendment 1:2006

IEC 62056-5-3:—, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer*¹

IEC 62056-6-2:—, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes*²

¹ To be published simultaneously with this part of IEC 62056.

² To be published simultaneously with this part of IEC 62056.

ISO/IEC 8802-2:1998, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 2: Logical link control*

NOTE See also the Bibliography.

3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions given in IEC 60050-300, IEC/TR 62051 and IEC/TR 62051-1 and the following apply.

Where there is a difference between the definitions in the glossary and those contained in product standards produced by TC 13, then the latter shall take precedence in applications of the relevant standard.

3.1 Terms and definitions

3.1.1

initiator

user-element of a client System Management Application Entity (SMAE). It uses the CIASE and xDLMS ASE and it is identified by its system title

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

3.1.2

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]

3.1.3

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]

3.1.4

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, modified]

3.1.5

registered system

server system, which has an individual, valid MAC address

Note 1 to entry: Therefore, this MAC address is different from "NEW Address", see IEC 61334-5-1: Medium Access Control.

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

3.1.6

reporting system

server system, which issues a DiscoverReport

[SOURCE: IEC 61334-4-511:2000, 3.9.6, modified]

3.1.7

sub-timeslot

the 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.

3.1.8

timeslot

the 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.

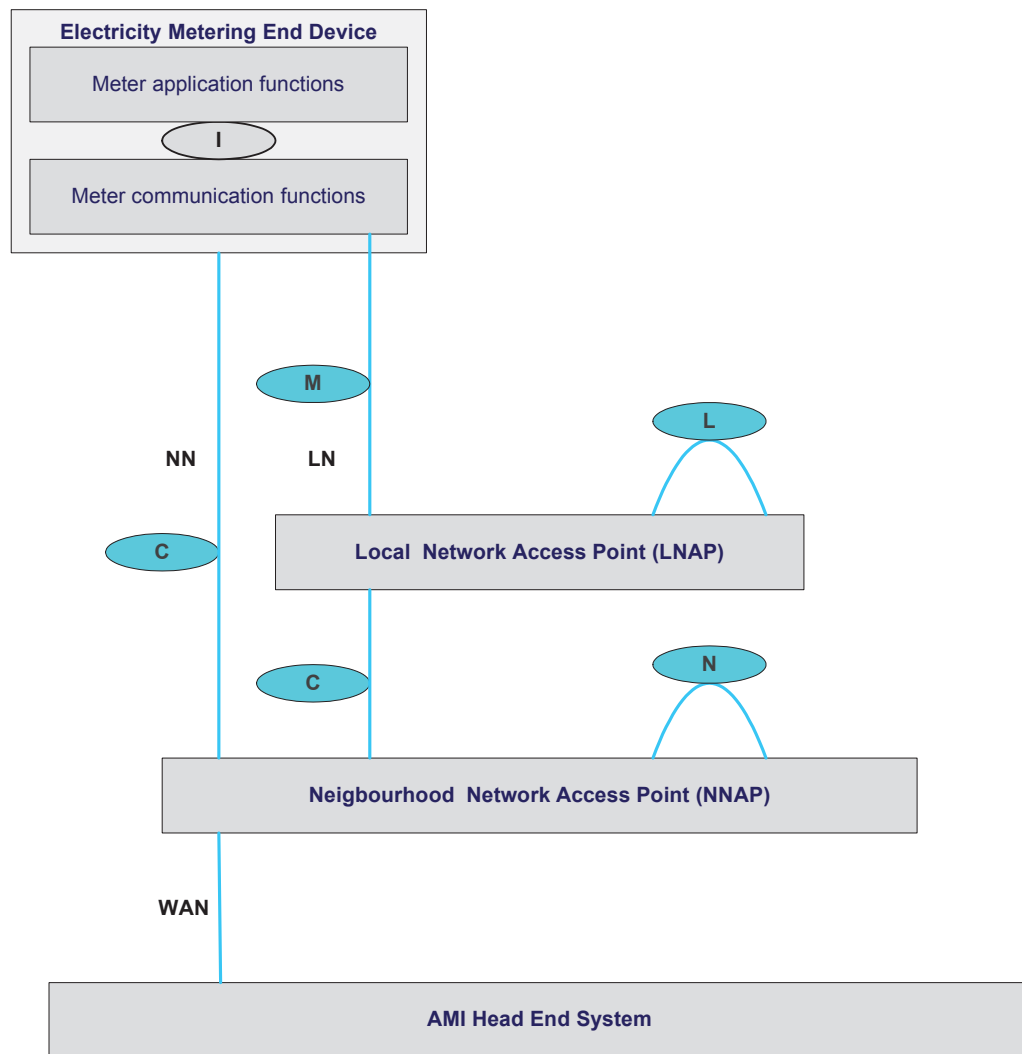
3.2 Abbreviations

.cnf	.confirm service primitive
.ind	.indication service primitive
.req	.request service primitive
.res	.response service primitive
AA	Application Association
AARE	A-Associate Response – an APDU of the ACSE
AARQ	A-Associate Request – an APDU of the ACSE
ACSE	Association Control Service Element
AES	Advanced Encryption Standard
AL	Application Layer
AP	Application Process
APDU	Application Layer Protocol Data Unit
ASE	Application Service Element
ASO	Application service Object
A-XDR	Adapted Extended Data Representation
CIASE	Configuration Initiation Application Service Element
CI-PDU	CIASE PDU
Client	A station, asking for services. In the case of the 3-layer, CO HDLC based profile it is the master station
COSEM	Companion Specification for Energy Metering
DA	Destination Address
DLMS	Device Language Message Specification
DLMS UA	DLMS User Association
FCS	Frame Check Sequence
GCM	Galois/Counter Mode, an algorithm for authenticated encryption with associated data
HCS	Header Check Sequence
HDLC	High-level Data Link Control
HES	(Metering) Head End System
ISO	International Organization for Standardization
LLC	Logical Link Control (Sublayer)
LN	Local Network
LNAP	Local Network Access Point

L-SAP	LLC sublayer Service Access Point
LSDU	LLC Service Data Unit
LV	Low voltage
MAC	Medium Access Control (sublayer)
MPDU	MAC Layer Protocol Data Unit
MSC	Message Sequence Chart
NN	Neighbourhood Network
NNAP	Neighbourhood Network Access Point
NS	Number of subframes (S-FSK MAC sublayer)
OSI	Open System Interconnection
PDU	Protocol Data Unit
PhL	Physical Layer
PLC	Power Line Carrier
PSDU	Physical Layer Service Data Unit
RDR	Reply Data on Request (used in IEC 61334-4-32)
RLRE	A-Release Response – an APDU of the ACSE
RLRQ	A-Release Request – an APDU of the ACSE
SA	Source Address
SAP	Service Access Point
SDN	Send Data Non-acknowledged (used in IEC 61334-4-32)
SDU	Service Data Unit
SMAE	Systems Management Application Entity
SMAP	Systems Management Application Process
SNRM	Set Normal Response Mode (a HDLC frame type)

4 Targeted communication environments

The DLMS/COSEM PLC S-FSK communication profile is intended for remote data exchange on Neighbourhood Networks (NN) between Neighbourhood Network Access Points (NNAP) *and* Local Network Access Points (LNAPs) or End Devices using S-FSK power line carrier technology over the low voltage electricity distribution network as a communication medium. The functional reference architecture is shown in Figure 1.



IEC 1149/13

Figure 1 – Communication architecture

End devices – typically electricity meters – comprise application functions and communication functions. They may be connected directly to the NNAP via the C interface, or to an LNAP via an M interface, while the LNAP is connected to the NNAP via the C interface. The LNAP function may be co-located with the metering functions.

A NNAP comprises gateway functions and it may comprise concentrator functions. Upstream, it is connected to the Metering Head End System (HES) using suitable communication media and protocols.

End devices and LNAPs may communicate to different NNAPs, but to one NNAP only at a time. From the PLC communication point of view, the NNAP acts as an initiator while end devices and LNAPs act as responders.

NNAPs and similarly LNAPs may communicate to each other, but this is out of the scope of this standard, which covers the C interface only.

When the NNAP has concentrator functions, it acts as a COSEM client. When the NNAP has gateway functions only, then the HES acts as a COSEM client. The end devices or the LNAPs act as COSEM servers.

5 Reference model

NOTE This clause is partly based on IEC 61334-4-1:1996, Clause 3.

The reference model of the *DLMS/COSEM PLC S-FSK communication profile* is shown in Figure 2. It is based on a simplified – or collapsed – three-layer OSI architecture. The layers are the *physical layer*, the *data link layer* and the *application layer*. The data link layer is split to the *MAC sublayer* and the *LLC sublayer*.

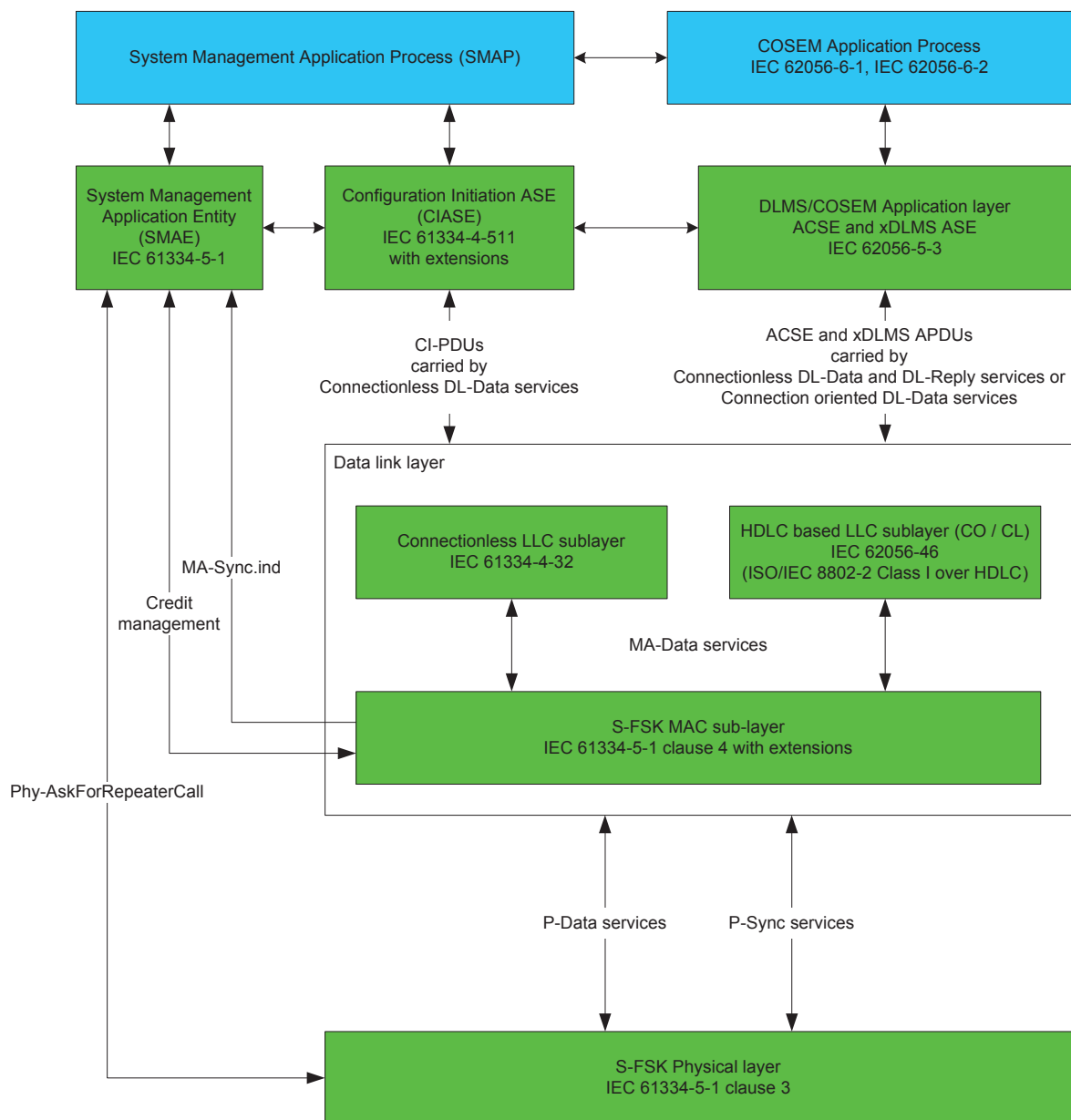


Figure 2 – The DLMS/COSEM S-FSK PLC communication profile

IEC 1150/13

6 The physical layer (PhL)

The PhL provides the interface between the equipment and the physical transmission medium that is the distribution network. It transports binary information from the source to the destination.

The PhL in this profile is as specified in IEC 61334-5-1:2001, Clause 3. It provides the following services to its service user MAC sublayer:

- P-Data services to transfer MPDUs to (a) peer MAC sublayer entity(ies) using the LV distribution network as the transport medium;
- P-Sync services to allow the MAC sublayer entity to ask for a new synchronization and to be informed of a change in the synchronization state of the PL. These services are used locally by the MAC sublayer.

See IEC 61334-5-1:2001, 3.4.

7 The data link layer

7.1 General

The data link layer consists of two sublayers: the Medium Access Control (MAC) and the Logical Link Control (LLC) sublayer.

The MAC sublayer handles access to the physical medium and provides physical device addressing. The decision to access the medium is made by the initiator, directly for its own MAC sublayer, or indirectly for other MAC sublayers that are requested to transmit a response to a request sent previously by the initiator.

The LLC sublayer controls the logical links.

There are two LLC sublayer alternatives available:

- the connectionless LLC sublayer, as specified in IEC 61334-4-32;
- the LLC sublayer using the HDLC based data link layer, as specified in IEC 62056-46.

7.2 The MAC sublayer

The MAC sublayer of the DLMS/COSEM S-FSK PLC communication profile is as specified in IEC 61334-5-1:2001, Clause 4. It provides the following services to its service user LLC sublayer:

- the MA-Data services. These services allow the LLC sublayer entity to exchange LLC data units with peer LLC sublayer entities. See IEC 61334-5-1:2001, 4.1.3.1;
- the MA-Sync.indication service. This allows the SMAE entity to be informed of the synchronization and configuration status of the device. See IEC 61334-5-1:2001, 4.1.3.2.

7.3 The connectionless LLC sublayer

The connectionless LLC sublayer is as specified in IEC 61334-4-32. It is derived from ISO/IEC 8802-2 – similar to Class III operation – and it performs the following functions:

- addressing of application entities within the equipment;
- sending data with no acknowledgement (SDN);
- reply data on request (RDR).

It provides the following services:

- DL-Data services for transporting CI-PDUs, ACSE APDUs and client-server type xDLMS APDUs;
- DL-Reply services for asking the remote LLC sublayer entity to send a previously prepared LSDU;
- DL-Update-Reply services to prepare the LSDUs to be transferred using the DL-Reply services.

For more details, see IEC 61334-4-32:1996, 2.1.

7.4 The HDLC based LLC sublayer

The HDLC based LLC sublayer is as specified in IEC 62056-46.

As explained in IEC 62056-46:2002, 4.1 and 4.2, this sublayer can also be divided to two sublayers:

- the LLC sublayer based on ISO/IEC 8802-2. Here, it is used in an extended Class I operation. The only role of this sublayer is to select the DLMS/COSEM Application layer by using a specific LLC address. The LLC services are provided by the HDLC based MAC sublayer;
- the MAC sublayer, based on the HDLC protocol. It provides addressing of application entities within the equipment.

NOTE In this profile, there are two MAC sublayers. The HDLC MAC sublayer provides reliable LLC data transport and segmentation. The Medium Access Control functionality is provided by the S-FSK MAC sublayer specified in 7.2.

The HDLC based LLC sublayer provides the following services:

- DL-Connect services to connect and to disconnect the data link layer;
- connectionless DL-Data services for transporting CI-PDUs, ACSE APDUs and xDLMS APDUs;
- connection oriented DL-Data services for transporting ACSE APDUs and xDLMS APDUs. These services provide reliable data transport and support segmentation to carry long messages, in a transparent manner for the application layer.

7.5 Co-existence of the connectionless and the HDLC based LLC sublayers

The frames of the connectionless LLC sublayer and the HDLC based LLC sublayer can be distinguished from each other as shown in Figure 3. This allows systems using the two profiles to co-exist on the same network.

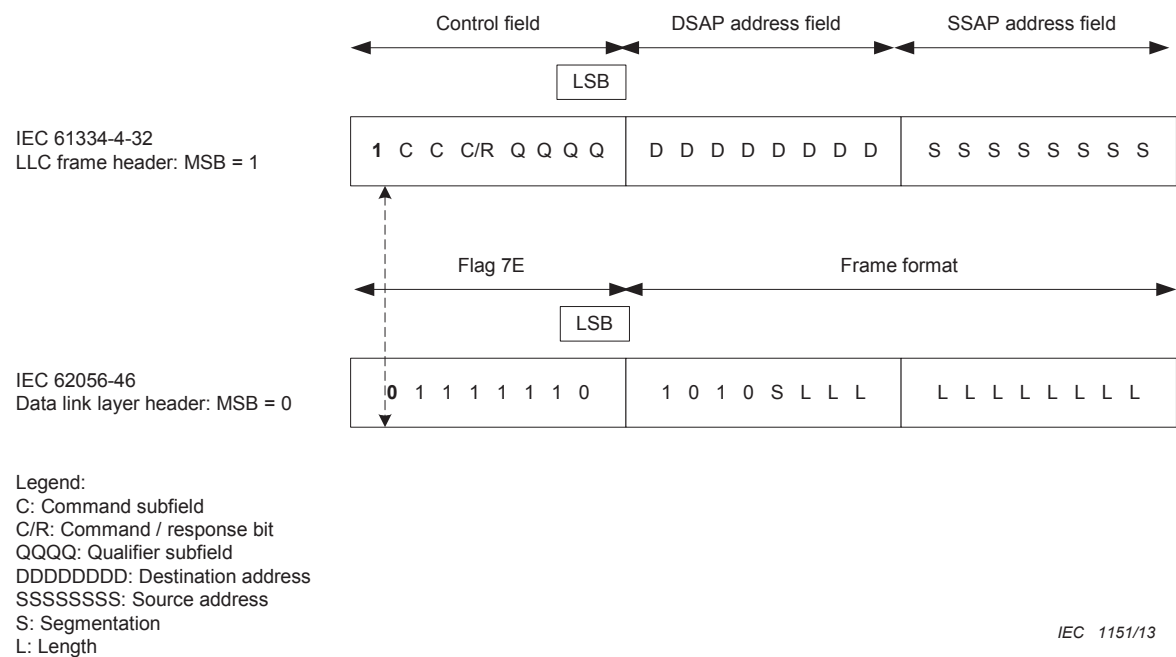


Figure 3 – Co-existence of the connectionless and the HDLC based LLC sublayers

8 The application layer (AL)

Concerning the application layer, the DLMS/COSEM Application layer as specified in IEC 62056-5-3 applies. It provides services to the COSEM application process (AP) and uses the services of the connectionless or the HDLC based LLC sublayer.

9 The application process (AP)

On the server side, the COSEM device- and object model – as specified in IEC 62056-6-2 – applies. Each logical device represents an AP.

The client side APs make use of the resources of the server side AP. A physical device may host one or more client APs.

10 The Configuration Initiation Application Service Element (CIASE)

NOTE This clause is based on IEC 61334-4-511 and constitutes an extension to it.

10.1 Overview

One of the activities of systems management is open system initialisation and / or modification. This is provided by the Configuration Initiation ASE (CIASE). It is specified in IEC 61334-4-511 with the extensions specified below.

The CIASE services are the following:

- the Discover service;
- the Register service;
- the PING service;
- the RepeaterCall service; and
- the ClearAlarm service.

The three latter services, together with the Intelligent Search Initiator process specified in 10.7, constitute upper compatible functional extensions to IEC 61334-4-511.

The CIASE uses the connectionless DL-Data services of the LLC sublayer.

10.2 The Discover service

NOTE In this document, the description of the CIASE services follows the presentation style used for the DLMS/COSEM services. For the notation used, see IEC 62056-5-3:—, 6.1.

The Discover service is used to discover new systems or systems, which are in alarm state. It is specified in IEC 61334-4-511:2000, 7.1. The Discover service primitives shall provide the parameters as shown in Table 1.

Table 1 – Service parameters of the Discover service primitives

	Discover		DiscoverReport	
	.request	.indication	.response	.confirm
Argument	M	M (=)	–	–
Response_Probability	M	M (=)		
Allowed_Time_Slots	M	M (=)		
DiscoverReport_Initial_Credit	M	M (=)		
IC_Equal_Credit	M	M (=)	–	–
Result (+)			S	S (=)
System_Title {System_Title}	–	–	M	M (=)
Alarm_Descriptor			C	C (=)
Result (-)			S	S (=)
Argument_Error(s)	–	–	M	M (=)
NOTE This Table 1 is included here for completeness and to correct some editorial errors in IEC 61334-4-511:2000, 7.1. For the description of the service parameters, see the clause referenced here.				

10.3 The Register service

The Register service is used to perform system configuration. It assigns a MAC address to a new system identified by its system title. It is specified in IEC 61334-4-511:2000, 7.2. The Register service primitives shall provide the parameters as shown in Table 2.

Table 2 – Service parameters of the Register service primitives

	.request	.indication
Argument		
Active_Initiator_System_Title	M	M (=)
List_Of_Correspondence	M	M (=)
New_System_Title	M	M (=)
MAC_Address	M	M (=)
Result (+)	S	S
Result (–)	S	S
Argument_Error(s)	M	M (=)
NOTE This Table 2 is included here for completeness. For the description of the service parameters, see IEC 61334-4-511:2000, 7.2.		

NOTE 1 If a server in NEW state receives a correct Register service with its own server system title in it, it will be registered, even if it did not receive a Discover service before.

NOTE 2 Only those servers in the NEW state can be registered.

10.4 The Ping Service

Function

The Ping service is used to check that a server system already registered is still present on the network. It also allows verifying that the right physical device is linked to the right MAC address. It also allows preventing the *time_out_not_addressed* timer to expire.

The process begins with a Ping.request service primitive issued by the active initiator. The service contains the system title of the physical device pinged. The PingRequest CI-PDU is carried by a DL-Data.request service primitive and it is sent to the MAC address assigned to this system and to the server CIASE L-SAP.

If the system title carried by the Ping.indication service primitive is equal to the system title of the server, the server shall respond with a Ping.response service primitive, carrying the system title of the server. It is sent to the initiator CIASE L-SAP.

Semantics

The PING service primitives shall provide parameters as shown in Table 3.

Table 3 – Service parameters of the PING service primitives

	.request	.indication	.response	.confirm
Argument System_Title_Server	M	M (=)	-	-
Result (+) System_Title_Server	–	–	S M	S (=) M (=)
Result (–) Argument_Error(s)	–	–	S M	S M (=)