IEC 62056-9-7

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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inside

**Electricity metering data exchange – The DLMS/COSEM suite –
Part 9-7: Communication profile for TCP-UDP/IP networks**

**Échange des données de comptage de l'électricité – La suite DLMS/COSEM –
Partie 9-7: Profil de communication pour réseaux TCP-UDP/IP**

IEC 62056-9-7:2013

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<div align="center">
DLMS[1] User Association
Zug/Switzerland
www.dlms.ch
</div>

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[1] Device Language Message Specification.

International Standard IEC 62056-9-7 has been prepared by IEC technical committee 13: Electrical energy measurement, tariff- and load control.

It is based on IEC 62056-53 Ed.2:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM application layer*, Annex B.3, *The TCP-UDP/IP based communication profiles (COSEM_on_IP)* and introduces the following significant technical changes:

NOTE Whereas IEC 62056-53 Ed. 2.0 contains the specification of the DLMS/COSEM communication profiles, IEC 62056-5-3 Ed.1.0 replacing the earlier edition does not.

• The title of the standard has been aligned with the title of other parts of the revised IEC 62056 series;

• Clause 4, *Targeted communication environments* has been extended, a functional reference architecture figure has been added;

• Clause 5, *The structure of the profile(s)* has been extended, the Figure has been generalized and simplified;

• In clause 6, *Identification and addressing scheme,* the port number assigned by the IANA for DLMS/COSEM has been added;

• In subclause 9.1, two paragraphs specifying how confirmed and unconfirmed COSEM-OPEN and xDLMS service invocations have been added;

• Subclause 9.6, *Transporting long messages,* has been amended. It specifies now that for transporting long messages, application layer block transfer can be used (also available now with SN referencing);

• The clause on Multi-drop configurations has been removed.

The text of this standard is based on the following documents:

FDIS	Report on voting
13/1520/FDIS	13/1537/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A list of all parts of IEC 62056, under the general title *Electricity metering data exchange – The DLMS/COSEM suite*, can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

• reconfirmed,
• withdrawn,
• replaced by a revised edition, or
• amended.

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ELECTRICITY METERING DATA EXCHANGE –
THE DLMS/COSEM SUITE –

Part 9-7: Communication profile for TCP-UDP/IP networks

1 Scope

This part of IEC 62056 specifies the DLMS/COSEM communication profile for TCP-UDP/IP networks.

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 62056-47:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 47: COSEM transport layer for IPv4 networks*

IEC 62056-5-3:2013, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer*

NOTE   See also the Bibliography.

3 Terms, definitions and abbreviations

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

3.1 Terms and definitions

3.1.1
client
a station, asking for services. Normally the master station

3.1.2
server
a station, delivering services. The tariff device (meter) is normally the server, delivering the requested values or executing the requested tasks

3.2 Abbreviations

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
AL	Application Layer
AP	Application Process
APDU	Application Layer Protocol Data Unit

ARP   Address Resolution Protocol

ASE   Application Service Element

ATM   Asynchronous Transfer Mode

COSEM   Companion Specification for Energy Metering

DLMS   Device Language Message Specification

FDDI   Fiber Distributed Data Interface

HDLC   High-level Data Link Control

HTTP   Hypertext Transfer Protocol

IEEE   Institute of Electrical and Electronics Engineers

ISO   International Organization for Standardization

IP   Internet Protocol

LN   Local Network

NN   Neighbourhood Network

OSI   Open System Interconnection

PDU   Protocol Data Unit

PhL   Physical Layer

PPP   Point-to-Point Protocol

RLRE   A-Release Response – an APDU of the ACSE

RLRQ   A-Release Request – an APDU of the ACSE

SAP   Service Access Point

TCP   Transmission Control Protocol

TL   Transport Layer

UDP   User Datagram Protocol

WAN   Wide Area Network

xDLMS   Extended DLMS

4 Targeted communication environments

The TCP-UDP/IP based communication profiles are suitable for remote data exchange with metering equipment via IP enabled networks such as wide area networks, neighbourhood networks or local networks. This is shown in Figure 1.

IEC 688/13
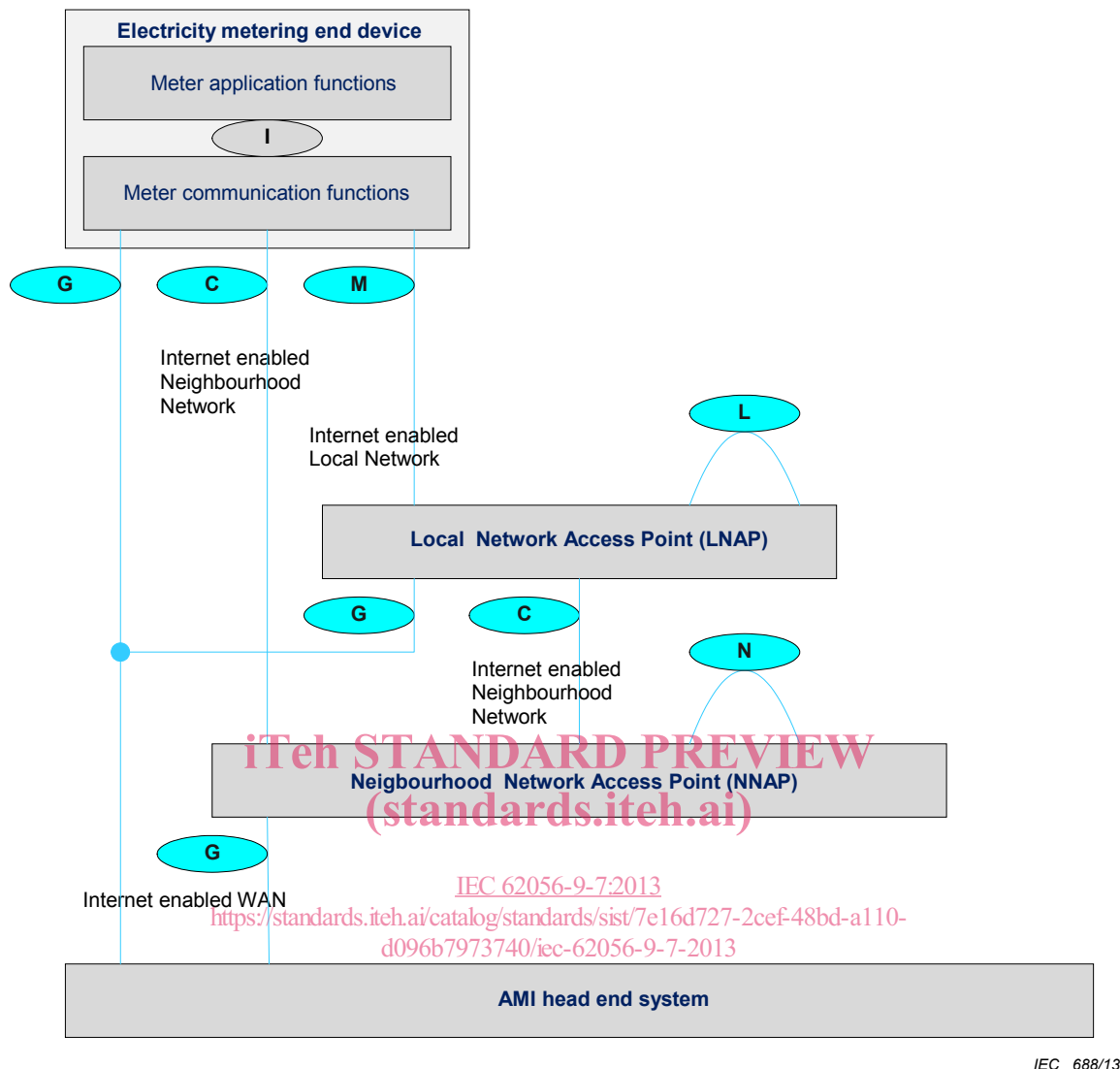
**Figure 1 – Communication architecture**

5   Structure of the profile(s)

The COSEM TCP-UDP/IP based communication profiles consist of five protocol layers:

- the DLMS/COSEM application layer, specified in IEC 62056-5-3;

- the COSEM transport layer, specified in IEC 62056-47;

- a network layer: the Internet protocol: IPv4, specified in STD 0005 or IPv6 specified in RFC 2460;

- a data link layer: any data link protocol supporting the network layer;

- a physical layer: any PhL supported by the data link layer chosen.

The COSEM AL uses the services of one of the TLs (TCP or UDP) via a wrapper, which, in their turn, use the services of the IP network layer to communicate with other nodes connected to this abstract network. The COSEM AL in this environment can be considered as another Internet standard application protocol, which may co-exist with other Internet application protocols, like FTP, HTTP, etc. See IEC 62056-47:2006, Figure 1.

The TCP-UDP/IP layers are implemented on a wide variety of real networks, which, just with the help of this IP Network abstraction, can be seamlessly interconnected to form Intra- and Internets using any set of lower layers supporting the Internet Protocol.
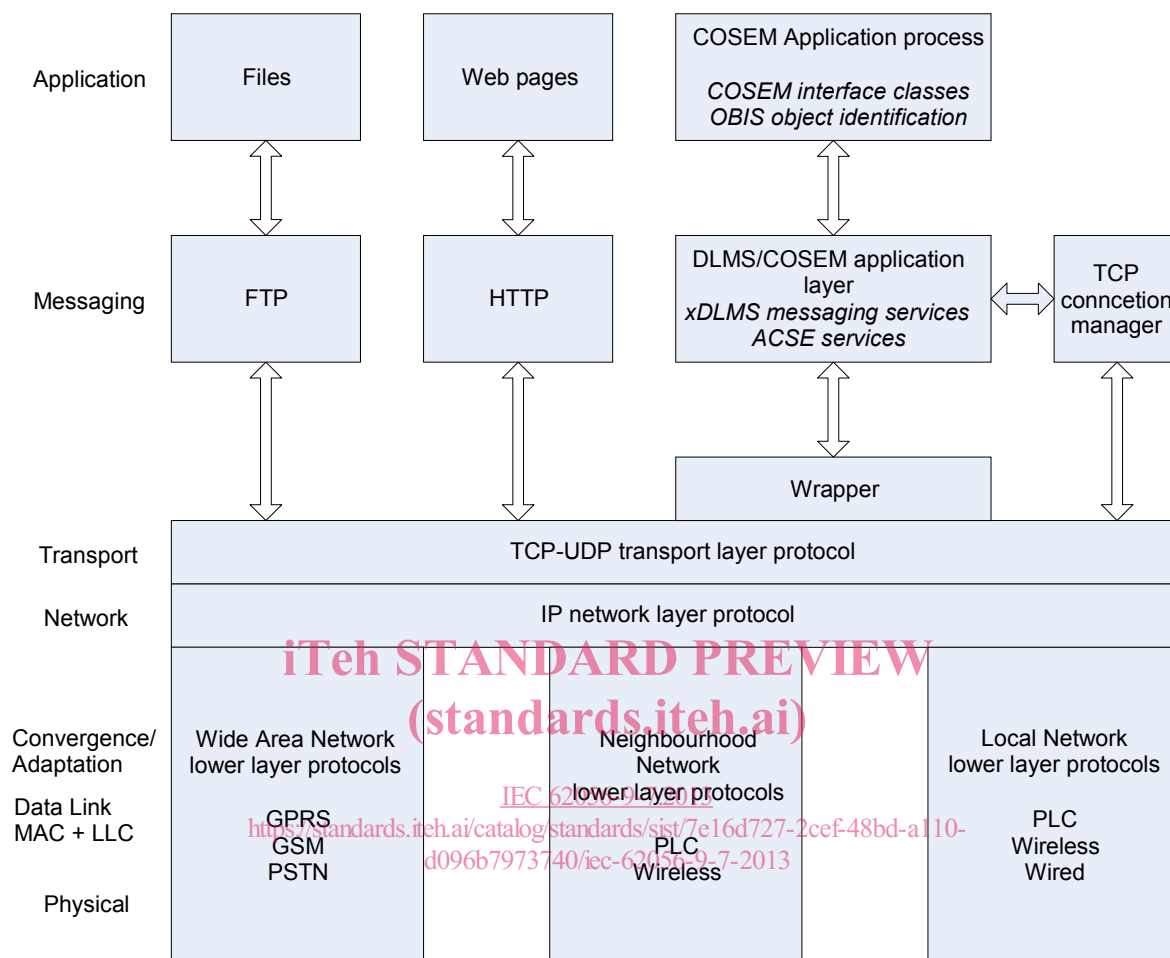
IEC   689/13

Figure 2 – Examples for lower-layer protocols in the TCP-UDP/IP based profile(s)

Below the IP layer, a range of lower layers can be used. One of the reasons of the success of the Internet protocols is just their federating force. Practically any data networks, including Wide Area Networks such as GPRS, ISDN, ATM and Frame Relay, circuit switched PSTN and GSM networks (dial-up IP), Local Area Networks, such as Ethernet, neighbourhood networks and local networks using power line carrier or wireless protocols, etc., support TCP-UDP/IP networking.

Figure 2 shows a set of examples – far from being complete – for such communication networks and for the lower layer protocols used in these networks. Using the TCP-UDP/IP profile, DLMS/COSEM can be used practically on any existing communication network.

6   Identification and addressing scheme

Although real-world devices even in the Internet environment are connected to real-world physical networks, at a higher abstraction (and protocol) level it can be considered as if these devices would be connected to a virtual – IP – network. On this virtual network, each device has a unique address, called IP address, which non-ambiguously identifies the device on this network.

Any device connected to this virtual IP network can send message(s) to any other connected device(s) using only the IP address to designate the destination device, without being concerned about the complexity of the whole physical network. Specific characteristics – the data transmission medium, the media access strategy, and the specific data-link addressing / identification scheme – of the particular physical network(s) participating in the route between the source and the destination device are hidden for the sender device. These elements are handled by intermediate network devices, called routers.

Therefore, in the TCP-UDP/IP based profiles COSEM physical devices are non-ambiguously identified by their network – IP – address.

The identification of COSEM client AP and server APs requires an additional address.

Both TCP and UDP provide additional addressing capability at the transport level, called *port*, to distinguish between applications. The AL is listening only on one TCP or UDP port for exchanging messages between any client and server APs. As in a single physical device several client or server APs may be present, an additional addressing capability is needed. This is provided by the wrapper sublayer, see IEC 62056-47. The wrapper provides an identifier – wPort – similar to the TCP or UDP port numbers, but on the top of these layers. A particular COSEM client AP and/or a particular COSEM logical device in the same physical device can be thus identified by its wPort number.

In summary, in the TCP-UDP/IP based profiles the following identification rules apply:

* COSEM physical devices are identified by their IP address;
* the COSEM AL is listening only on one UDP or TCP port. See IEC 62056-47:2006, Clause 4;
* COSEM logical devices and client APs within their respective host physical devices are identified by their wPort numbers. Reserved wPort numbers are specified in IEC 62056-47;
* lower layer addresses (SAP-s) are not considered (hidden).

COSEM AAs are identified by the identifiers of the two end-points as described above. Figure 3 shows an example.

AAs established between the client AP_01 and Logical_Device_01 in Host_device_01 (AA 1) and Logical_Device_02 in Host_Device_02 (AA2) respectively are identified by:

AA 1:   { (163.187.45.19, T_N, 31) (163.187.45.36, T_M, 527) }

AA 2:   { (163.187.45.19, T_N, 31) (163.187.45.78, T_M, 3013) }

NOTE 1   T_N and T_M mean the TCP port used for DLMS/COSEM in the client host device and the server host devices respectively. For DLMS/COSEM, the following port numbers have been registered by the IANA. See http://www.iana.org/assignments/port-numbers.

* dlms/cosem 4059/TCP DLMS/COSEM

* dlms/cosem 4059/UDP DLMS/COSEM

NOTE 2   In these two AAs the client side end-point identifiers are the same. However, the server side end-point identifiers are different, so the two AAs are identified unambiguously and therefore they can be used simultaneously.

NOTE 3   In these examples, IPv4 addresses are used.
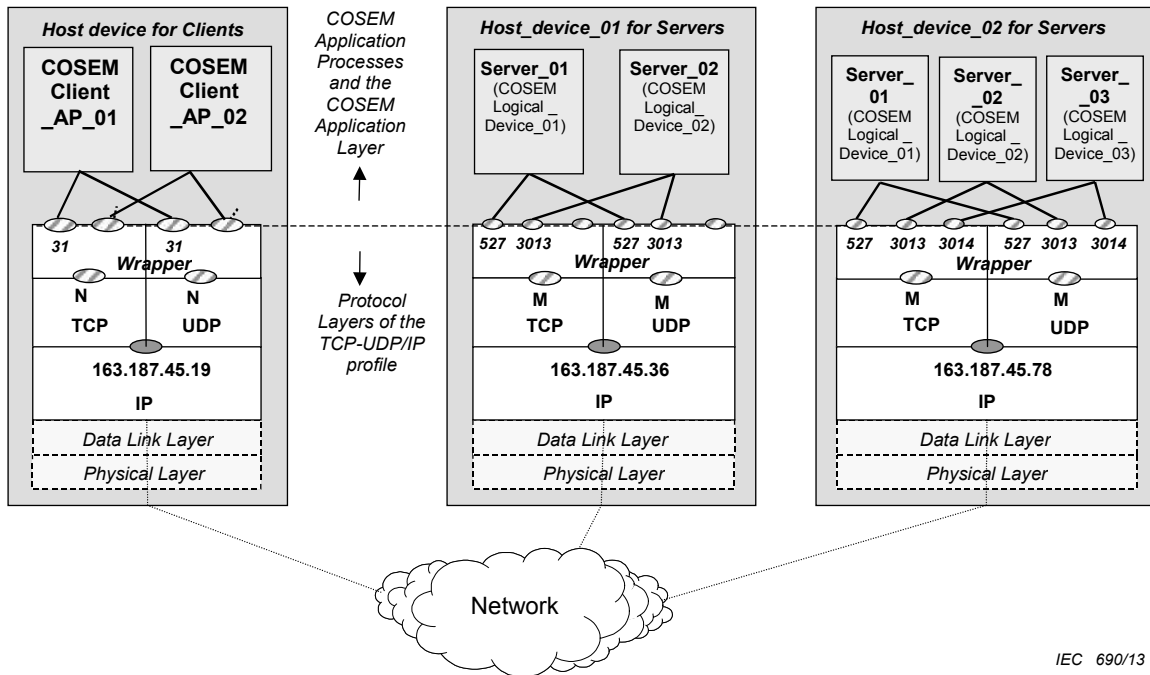
**Figure 3 – Identification / addressing scheme
in the TCP-UDP/IP based profile(s)**

iTeh STANDARD PREVIEW

7   Supporting layer services and service mapping (standards.iteh.ai)

As specified in IEC 62056-47, the COSEM TCP TL provides the following services to its
service users:

- Connection management services, provided for the TCP connection manager AP:

  – TCP-CONNECT: .request, .indication, .response, .confirm;

  – TCP-DISCONNECT: .request, .indication, .response, .confirm.

- Data exchange services, provided for the COSEM AL; these services can be used only
  when the TCP connection is established:

 – TCP-DATA: .request, .indication, (. confirm).

The TCP TL also provides a TCP-ABORT service to the service user COSEM AL to indicate
the disconnection/disruption of the TCP layer connection.

The UDP TL provides only one service to the service user COSEM AL: a connection-less,
best effort data delivery service.

- UDP-DATA: request, .indication, (.confirm).

NOTE   A TCP.confirm / UDP .confirm service primitive is optionally available.

Figure 4 summarizes these services.
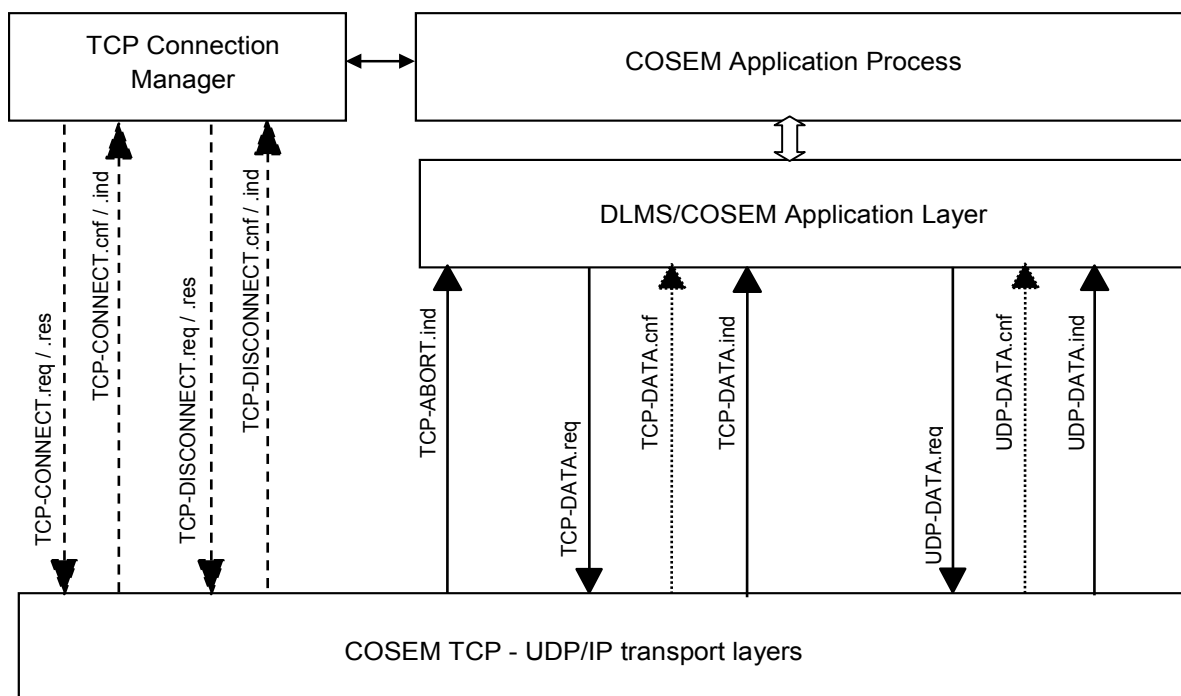
IEC   691/13

Figure 4 – Summary of TCP / UDP layer services

For connection management, the COSEM TCP TL provides the full set of the TCP-CONNECT and TCP-DISCONNECT services, both at the client and at the server sides. The purpose of this is to allow also the server to establish and release TCP connections. See also 9.7. As in all COSEM profiles, AA establishment and release is initiated by the client AP in these profiles as well.

The user of these services is not the COSEM AL, but the TCP Connection Manager AP. This process is implementation dependent, therefore it is out of the scope of this standard. The only requirements with regard to this process are:

- the TCP connection manager process shall be able to establish the supporting TCP connection without the intervention of the COSEM client- or server AP(s);

- the COSEM client- and server APs shall be able to retrieve the TCP and IP portion of the Protocol_Connection_Parameters parameter from the TCP connection manager before sending / receiving a COSEM-OPEN.request / .indication.

For data exchange, both the client- and the server ALs use the complete set of the service primitives provided by the COSEM TCP-UDP TLs.

The correspondence between an AL (ASO) service invocation and the supporting COSEM TCP-UDP layer service invocation is given in IEC 62056-47.

8   Communication profile specific service parameters of the COSEM AL services

Only the COSEM-OPEN service has communication profile specific parameters, the Protocol_Connection_Parameters parameter. This contains the following data:

- Protocol (Profile) Identifier   TCP/IP or UDP/IP;

- Server_IP_Address   COSEM Physical Device Address;