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**Messung der elektrischen Energie –
Zählerstandsübertragung, Tarif- und Laststeuerung –
Teil 47: COSEM Transportschichten für IPv4 Netzwerke
(IEC 62056-47:2006);
Deutsche Fassung EN 62056-47:2007, Text Englisch**

Electricity metering –
Data exchange for meter reading, tariff and load control –
Part 47: COSEM transport layers for IPv4 networks (IEC 62056-47:2006);
German version EN 62056-47:2007, text in English

Equipements de mesure de l'énergie électrique –
Echange des données pour la lecture des compteurs, le contrôle des tarifs et de la charge –
Partie 47: Couches de transport COSEM pour réseaux IPv4 (CEI 62056-47:2006);
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Beginn der Gültigkeit

Die von CENELEC am 2006-12-01 angenommene EN 62056-47 gilt als DIN-Norm ab 2007-06-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 62056-47:2006-04.

Für diese Norm ist das nationale Arbeitsgremium K 461 „Elektrizitätszähler“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (<http://www.dke.de>) zuständig.

Die enthaltene IEC-Publikation wurde vom TC 13 „Equipment for electrical energy measurement and load control“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem auf der IEC-Website unter „<http://webstore.iec.ch>“ mit den Daten zu dieser Publikation angegebenen Datum (maintenance result date) unverändert bleiben soll. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

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Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

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Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

K 461 hat auf seiner Sitzung am 19. September 2006 festgestellt, dass die Bedingungen des DIN-Präsidialbeschlusses 1/2004 für die vorliegende Norm erfüllt sind. Demnach besteht die Europäische Norm EN 62056-47 nur in einer englischen Sprachfassung, weil sie nicht unmittelbar im Zusammenhang mit Rechtsvorschriften steht und nicht als Sicherheitsnorm anzusehen ist. Es kann davon ausgegangen werden, dass die Anwender dieser Norm über hinreichende englische Sprachkenntnisse verfügen. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennung bedienen.

Einführung in die DIN EN 62056-47

Dieser Teil der Reihe IEC 62056 legt die Transportschicht für COSEM-Kommunikationsprofile zur Anwendung in IPv4-Netzen fest.

Diese Kommunikationsprofile enthalten verbindungslose und verbindungsorientierte Transportschichten, wobei Dienste vom Typ OSI an die COSEM-Anwendungsschicht des Dienstnutzers geliefert werden. Die verbindungslose Transportschicht basiert auf dem Internet Standard User Datagram Protocol (UDP). Die verbindungsorientierte Transportschicht basiert auf dem Internet Standard Transmission Control Protocol (TCP).

Obwohl der größere Teil der COSEM-Transportschichten aus dem UDP und dem TCP besteht, wie sie in den einschlägigen Internet-Normen festgelegt sind, enthalten diese eine zusätzliche Teilschicht, genannt „Wrapper“.

Anhang A (informativ) erläutert, wie die Dienste der Transportschichten vom Typ OSI in UDP- und TCP-Funktionsrufe umgewandelt werden können und umgekehrt.

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Diese Europäische Norm wurde von CENELEC am 2006-12-01 angenommen. Die CENELEC-Mitglieder sind gehalten, die CEN/CENELEC-Geschäftsordnung zu erfüllen, in der die Bedingungen festgelegt sind, unter denen dieser Europäischen Norm ohne jede Änderung der Status einer nationalen Norm zu geben ist.

Auf dem letzten Stand befindliche Listen dieser nationalen Normen mit ihren bibliographischen Angaben sind beim Zentralsekretariat oder bei jedem CENELEC-Mitglied auf Anfrage erhältlich.

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CENELEC

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique

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Vorwort

Der Text des Schriftstücks 13/1386/FDIS, zukünftige 1. Ausgabe von IEC 62056-47, ausgearbeitet von dem IEC/TC 13 „Electrical energy measurement, tariff- and load control“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2006-12-01 als EN 62056-47 angenommen.

Nachstehende Daten wurden festgelegt:

- spätestes Datum, zu dem die EN auf nationaler Ebene durch Veröffentlichung einer identischen nationalen Norm oder durch Anerkennung übernommen werden muss (dop): 2007-09-01
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Die IEC und CENELEC nehmen keine Stellung zur Rechtmäßigkeit, zur Gültigkeit und zum Anwendungsbereich dieses Wartungs-Dienstes.

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DLMS¹⁾ User Association
Geneva/Switzerland
www.dlms.ch

Der Anhang ZA wurde von CENELEC hinzugefügt.

Anerkennungsnotiz

Der Text der Internationalen Norm IEC 62056-47:2006 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

In der offiziellen Fassung ist unter „Literaturhinweise“ zu der aufgelisteten Norm die nachstehende Anmerkung einzutragen:

IEC 62056-46 ANMERKUNG Harmonisiert als EN 62056-46:2002 (nicht modifiziert).

¹⁾ Device Language Message Specification

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1 Scope

This part of IEC 62056 specifies the transport layers for COSEM communication profiles for use on IPv4 networks.

These communication profiles contain a connection-less and a connection-oriented transport layer, providing OSI-style services to the service user COSEM application layer. The connection-less transport layer is based on the Internet standard User Datagram Protocol. The connection-oriented transport layer is based on the Internet standard Transmission Control Protocol.

Although the major part of the COSEM transport layers is the UDP and TCP as they are specified in the relevant Internet standards, they include an additional sub-layer, called wrapper.

Annex A shows how the OSI-style transport layer services can be converted to and from UDP and TCP function calls.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60050-300:2001, *International Electrotechnical Vocabulary (IEV) – Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument*.

IEC 62051:1999, *Electricity metering – Glossary of terms*

IEC 62051-1:2004, Ed.1., *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 62056-53, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM application layer*³

IEC 62056-62, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 62: Interface classes*³

STD0005 – *Internet Protocol*

Author: J. Postel

Date: September 1981

Also: RFC0791, RFC0792, RFC0919, RFC0922, RFC0950, RFC1112

STD0006 – *User Datagram Protocol*

Author: J. Postel

Date: 28 August 1980

Also: RFC0768

STD0007 – *Transmission Control Protocol*

Author: J. Postel

Date: September 1981

Also: RFC0793

See also Bibliography for other related Internet RFCs.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.2 Abbreviations

APDU	Application Layer Protocol Data Unit
COSEM	Companion Specification for Energy Metering
COSEM_on_IP	The TCP-UDP/IP based COSEM communication profile
IP	Internet Protocol
PDU	Protocol Data Unit
PAR	Positive Acknowledgement with Retransmission
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
WPDU	Wrapper Protocol Data Unit

4 Overview

This standard specifies two transport layers for the COSEM_on_IP communication profiles: a connection-less transport layer, based on UDP, Internet standard STD0006 and a connection-oriented transport layer, based on TCP, Internet standard STD0007.

In these profiles, the COSEM application layer uses the services of one of these transport layers, which use then the services of the Internet Protocol (IPv4) network layer to communicate with other nodes connected to the abstract IPv4 network.

When used in these profiles, the COSEM application layer can be considered as another Internet standard application protocol (like the well-known HTTP, FTP or SNMP) and it may co-exist with other Internet application protocols, as shown in

Figure 1.

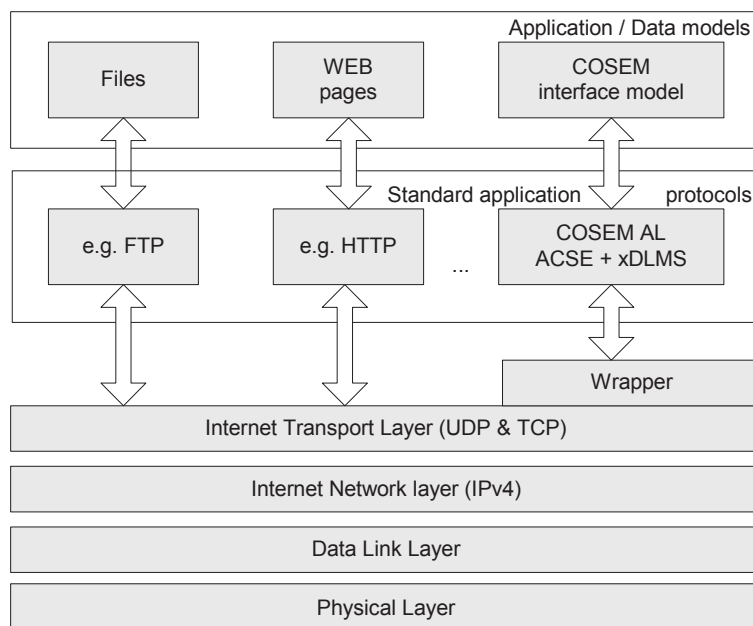


Figure 1 – COSEM as a standard Internet application protocol

As the COSEM application layer specified in IEC 62056-53 uses and provides OSI-style services, a wrapper has been introduced between the UDP/TCP layers and the COSEM application layer.

Therefore, the COSEM transport layers consist of a wrapper sub-layer and the UDP or TCP transport layer.

The wrapper sub-layer is a lightweight, nearly state-less entity: its main function is to adapt the OSI-style service set, provided by the COSEM transport layer, to UDP or TCP function calls and vice versa.

In addition, the wrapper sub-layer has the following functions:

- it provides an additional addressing capability (wPort) on top of the UDP/TCP port;
- it provides information about the length of the data transported. This feature helps the sender to send and the receiver to recognize the reception of a complete APDU, which may be sent and received in multiple TCP packets.

As specified in IEC 62056-53, B.3.3, the COSEM application layer is listening only on one UDP or TCP port. On the other hand, as defined in IEC 62056-62, a COSEM physical device may host several client application processes or server logical devices. The additional addressing capability provided by the wrapper sub-layer allows identifying these application processes.

The structure of the COSEM transport layer and their place in COSEM-on_IP is shown in Figure 2.

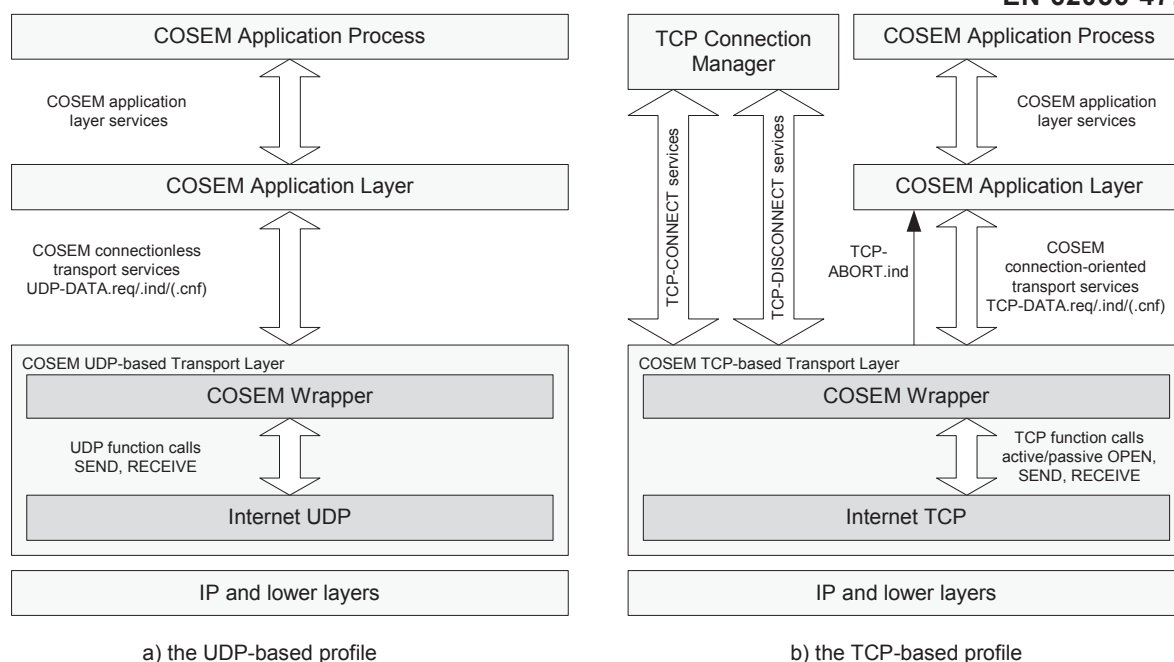


Figure 2 – Transport layers of the COSEM_on_IP profile

The service user of the UDP-DATA and the TCP-DATA services is the COSEM application layer. On the other hand, the service user of the TCP-CONNECT and TCP-DISCONNECT services is the TCP Connection Manager Process. The COSEM TCP-based transport layer also provides a TCP-ABORT.indication service to the service user COSEM application layer.

5 The COSEM connection-less, UDP-based transport layer

5.1 General

The COSEM connection-less transport layer is based on the User Datagram Protocol (UDP) as specified in STD0006.

UDP provides a procedure for application programs to send messages to other programs with a minimum of protocol mechanism. On the one hand, the protocol is transaction oriented, and delivery and duplicate protection are not guaranteed. On the other hand, UDP is simple, it adds a minimum of overhead, it is efficient and easy to use. Several well-known Internet applications, like SNMP, DHCP, TFTP, etc. take advantage of these performance benefits, either because some datagram applications do not need to be reliable or because the required reliability mechanism is ensured by the application itself. Request/response type applications, like a confirmed COSEM application association established on the COSEM UDP-based transport layer, then invoking confirmed COSEM data communication services is a good example for this second category. Another advantage of UDP is that being connection-less, it is easily capable of multi- and broadcasting.

UDP basically provides an upper interface to the IP layer, with an additional identification capability, the UDP port number. This allows distinguishing between application processes, hosted in the same physical device and identified by its IPv4 address².

² The addressing/identification scheme for the COSEM_on_IP profiles is defined in IEC 62056-53, B.3.3.

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As already mentioned in Clause 4, the COSEM application layer is listening only on one UDP port. On the other hand, as defined in IEC 62056-62, a COSEM physical device may host several client application processes or server logical devices. The additional addressing capability provided by the wrapper sub-layer, using the wrapper port (wPort) numbers on top of the UDP/TCP port numbers allows identifying these application processes.

The wrapper also adds length information to the APDU to be transported.

5.2 Service specification for the COSEM UDP-based transport layer

5.2.1 General

The COSEM UDP-based transport layer provides the same set of services both at the Client and at the Server sides, as shown in Figure 3.

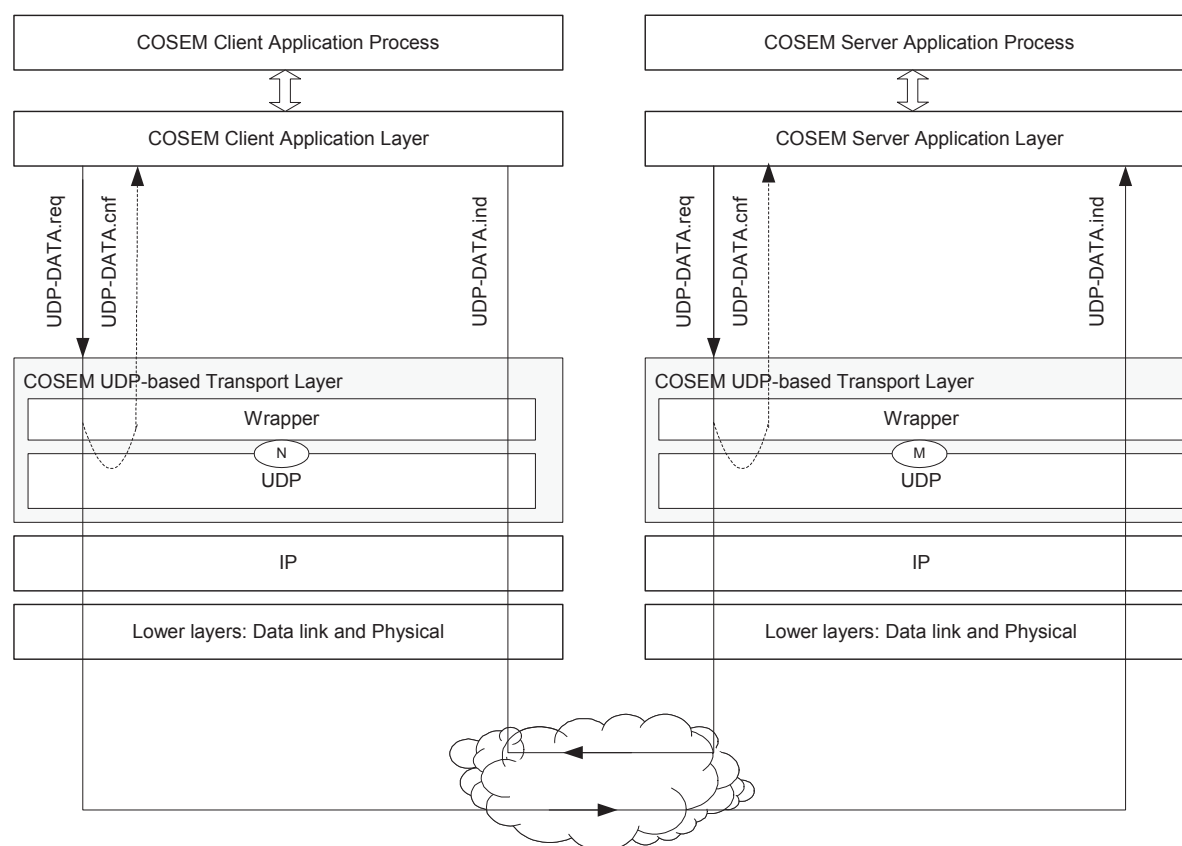


Figure 3 – Services of the COSEM connection-less, UDP-based transport layer

The COSEM UDP-based transport layer provides only data communication services: the connection-less UDP-DATA services. The service set for the UDP-DATA services is the same at both the client and server sides: consequently, the service specification for these services is the same for both the client and server transport layers.

The .request and .indication service primitives are mandatory. The implementation of the local .confirm service primitive is optional.

NOTE The APDU pre-fixed with the header by the wrapper sub-layer must fit in a single UDP datagram.

5.2.2 The UDP-DATA services

5.2.2.1 UDP-DATA.request

Function

This service primitive is invoked by the service user COSEM application layer to request the transmission of an APDU to the peer COSEM application layer.

Service parameters

The semantics of the primitive is as follows:

```

UDP-DATA.request
(
    Local_wPort,
    Remote_wPort,
    Local_UDP_Port,
    Remote_UDP_Port,
    Local_IP_Address,
    Remote_IP_Address,
    Data_Length,
    Data
)

```

The Local_wPort, Local_UDP_Port and Local_IP_Address parameters indicate wrapper Port number, UDP Port number and IP Address parameters belonging to the device/application process requesting to send the Data.

The Remote_wPort, Remote_UDP_Port and Remote_IP_Address parameters indicate the wrapper Port number, UDP Port number and IP Address parameters belonging to the device/application process to which the Data is to be transmitted.

The Local_UDP_Port and Remote_UDP_Port parameters identify the local and remote UDP ports respectively. Note, that as no well-known port number is reserved for COSEM communications, the value of these parameters must be in the non-privileged range (above 1024).

The Data_Length parameter indicates the length of the Data parameter in bytes.

The Data parameter contains the COSEM APDU to be transferred to the peer application layer.

Use

The UDP-DATA.request primitive is invoked by either the client or the server COSEM application layer to request sending an APDU to a single peer application layer, or, in the case of multi- or broadcasting, to multiple peer application layers.

The reception of this service primitive shall cause the wrapper sub-layer to pre-fix the wrapper header to the APDU received, and then to call the SEND() function of the UDP sub-layer with the properly formed WPDU, see at 5.3.2, as DATA. The UDP sub-layer shall transmit the WPDU to the peer wrapper sub-layer as described in STD0006.

5.2.2.2 UDP-DATA.indication

Function

This service primitive is invoked by the COSEM transport layer to indicate to the service user COSEM application layer that an APDU has been received from a remote application layer.

Service parameters

The semantics of the primitive is as follows:

```
UDP-DATA.indication
(
    Local_wPort,
    Remote_wPort,
    Local_UDP_Port,
    Remote_UDP_Port,
    Local_IP_Address,
    Remote_IP_Address,
    Data_Length,
    Data
)
```

The Local_wPort, Local_UDP_Port and Local_IP_Address parameters indicate wrapper Port number, UDP Port number and IP Address parameters belonging to the device/application process receiving the Data.

The Remote_wPort, Remote_UDP_Port and Remote_IP_Address parameters indicate the wrapper Port number, UDP Port number and IP Address parameters belonging to the device/application process, which has sent the data.

The Local_UDP_Port and Remote_UDP_Port parameters identify the local and remote UDP ports respectively. Note, that as no well-known port number is reserved for COSEM communications, the value of these parameters must be in the non-privileged range (above 1024).

The Data_Length parameter indicates the length of the Data parameter in bytes.

The Data parameter contains the COSEM APDU received from the peer application layer.

Use

The UDP-DATA.indication service primitive is used to indicate to the service user COSEM application layer that an APDU from the peer layer entity has been received.

The primitive is generated following the reception of an UDP Datagram by the UDP sub-layer, if both the Local_UDP_Port and Local_wPort parameters of the message received contain valid wPort numbers, meaning that there is a COSEM application process in the receiving device bound to the given port numbers. Otherwise, the message received shall simply be discarded.

5.2.2.3 UDP-DATA.confirm

Function

This optional service primitive is invoked by the COSEM transport layer to confirm to the service user COSEM application layer the result of the previous UDP-DATA.request service. The service represents a local confirmation only.

Service parameters

The semantics of the primitive is as follows:

```

UDP-DATA.confirm
(
    Local_wPort,
    Remote_wPort,
    Local_UDP_Port,
    Remote_UDP_Port,
    Local_IP_Address,
    Remote_IP_Address,
    Result
)

```

The Local_wPort, Remote_wPort, Local_UDP_Port, Remote_UDP_Port, Local_IP_Address and Remote_IP_Address parameters carry the same values as the corresponding UDP-DATA.request service being confirmed.

The value of the Result parameter indicates whether the COSEM UDP-based transport layer was able to send the requested UDP Datagram (OK) or not (NOK).

Use

If implemented, this service primitive is used to confirm the result of a previous UDP-DATA.request service. It is locally generated and indicates only whether the Data in the .request primitive could be sent or not. In other words, an UDP-DATA.confirm with Result == OK means only that the Data has been sent, and does not mean that the Data has been (or will be) successfully delivered to the destination.

5.3 Protocol specification for the COSEM UDP-based transport layer

5.3.1 General

As it is shown on the left side of Figure 2, the COSEM UDP-based transport layer includes the Internet standard UDP layer, as specified in Internet standard STD0006, and the COSEM-specific light-weight wrapper sub-layer.

In this communication profile, the wrapper sub-layer is a state-less entity: its only roles are to ensure source and destination COSEM application process identification using the wPort numbers and to provide conversion between the OSI-style UDP-DATA.xxx service invocations and the SEND() and RECEIVE() interface functions provided by the standard UDP.

Although it is not necessary in the UDP-based profile, in order to have the wrapper protocol control information – in other words the wrapper header – the same in both COSEM transport layers, the wrapper sub-layer shall also include the Data Length information in the wrapper protocol data unit.

5.3.2 The wrapper protocol data unit (WPDU)

The WPDU consists of two parts:

- the wrapper header part, containing the wrapper protocol control information, and
- the Data part, containing the DATA parameter – the COSEM APDU – of the corresponding UDP-DATA.xxx service invocation.