

TECHNICAL SPECIFICATION



Electricity metering data exchange – The DLMS/COSEM suite –
Part 8-20: Mesh communication profile for neighbourhood networks
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICITY METERING DATA EXCHANGE –
THE DLMS/COSEM SUITE –****Part 8-20: Mesh communication profile
for neighbourhood networks**

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The IEC takes no position concerning the evidence, validity and scope of this maintenance service.

The provider of the maintenance service has assured the IEC that he is willing to provide services under reasonable and non-discriminatory terms and conditions for applicants throughout the world. In this respect, the statement of the provider of the maintenance service is registered with the IEC. Information may be obtained from:

DLMS User Association
Zug/Switzerland
www.dlms.com

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62056-8-20, which is a technical specification, has been prepared by technical committee 13: Electrical energy measurement and control.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
13/1673/DTS	13/1704/RVC

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

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

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

<https://standards.iteh.ai/catalog/standards/sist/942e1d16-33b4-44b7-90b4-6114c0f7ccce/iec-ts-62056-8-20-2016>

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- reconfirmed,
- withdrawn,
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INTRODUCTION

As defined in IEC 62056-1-0, the IEC 62056 DLMS/COSEM suite provides specific communication profile standards for communication media relevant for smart metering.

Such communication profile standards specify how the COSEM data model and the DLMS/COSEM application layer can be used on the lower communication media-specific protocol layers.

Communication profile standards refer to communication standards that are part of the IEC 62056 DLMS/COSEM suite or to any other open communication standard.

This Technical Specification specifies a DLMS/COSEM IPv6 based communication profile that can be used in large scale AMI deployments where the Neighbourhood Networks are mesh networks.

The communication profile specified in this Technical Specification can be used over various suitable technologies providing a Neighbourhood Network with mesh topology, as long as they are capable to carry IPv6 traffic.

This specification follows the rules defined in IEC 62056-5-3:2016, Annex A.

The communication profile specified in this specification addresses the specificities resulting from the properties of the mesh network and the large quantity of devices to be managed.

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ELECTRICITY METERING DATA EXCHANGE – THE DLMS/COSEM SUITE –

Part 8-20: Mesh communication profile for neighbourhood networks

1 Scope

This part of IEC 62056 specifies a DLMS/COSEM communication profile that can be used in a smart metering system in which the Neighbourhood Networks (NN) are mesh networks.

This profile may be considered as an adaptation and extension of the UDP/IP communication profile specified in IEC 62056-9-7:2013. As in that standard, the PHY and MAC layers are out of the Scope.

This Technical Specification specifies a number of features essential to the efficient operation of a large scale AMI using mesh NNs. These features include:

- identification of the DLMS/COSEM client and server participating in an application association (AA) with their system title, so that this identification does not change when the IP address of the server changes, see Clause 6;
- a mechanism to inform the client of the binding between the server's system title and its current IP address(es), see 5.5.3;
- the use of the DLMS/COSEM UDP based transport layer, that allows keeping DLMS/COSEM AAs open for long periods, while the device may leave and join the mesh NN and/or its IP address may change, see 7.2.2;
- DLMS/COSEM application layer and application process level security features that can be used in a mesh environment, see 7.4.2;
- a mechanism to organize servers to one or more groups based on various conditions, so that the requests can be broadcasted to all devices attached to the mesh network, but only those servers belonging to the group carry out the request and respond, see 8.2;
- a mechanism that allows to send the response to a request in designated time windows and with a randomized delay, see 8.3.
- the use of a specific UDP port that allows efficient UDP header compression, see 6.3.3.

The Scope of this communication profile specification is restricted to aspects concerning the use of communication protocols in conjunction with the COSEM data model and the DLMS/COSEM application layer. Any project specific definitions of data structures and data contents may be provided in project specific companion specifications.

2 Normative references

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.

IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at www.electropedia.org)

IEC TR 62051, *Electricity metering – Glossary of terms*

IEC TR 62051-1, *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 62056-1-0, *Electricity metering data exchange – The DLMS/COSEM suite – Part 1-0: Smart metering standardisation framework*

IEC 62056-4-7, *Electricity metering data exchange – The DLMS/COSEM suite – Part 4-7: DLMS/COSEM transport layer for IP networks*

IEC 62056-5-3:2016, *Electricity metering data exchange – The DLMS/COSEM suite – Part 5-3: DLMS/COSEM application layer*

IEC 62056-6-1, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object Identification System (OBIS)*

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

IEC 62056-9-7:2013, *Electricity metering data exchange – The DLMS/COSEM suite – Part 9-7: Communication profile for TCP-UDP/IP networks*

RFC 768, User Datagram Protocol Edited by J. Postel. August 1980. Available from <https://www.ietf.org/rfc/rfc768.txt>

RFC 2460, Internet Protocol, Version 6 (IPv6) Specification [online]. Edited by R. Hinden, S. Deering. December 1998. Available from <http://tools.ietf.org/html/rfc2460>

RFC 3315, Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Edited by R. Droms, J. Bound, B. Volz, T. Lemon, C. Perkins, M. Carney. July 2003. Available from <http://www.ietf.org/rfc/rfc3315.txt>

RFC 4291, IP Version 6 Addressing Architecture [online]. Edited by R. Hinden, S. Deering. February 2006. Available from <http://tools.ietf.org/html/rfc4291>

RFC 4862, IPv6 Stateless Address Autoconfiguration. Edited by S. Thomson, T. Narten, T. Jinmei. September 2007. Available from <https://tools.ietf.org/html/rfc4862>

RFC 4944, Transmission of IPv6 Packets over IEEE 802.15.4 Networks [online]. Edited by G. Montenegro, N. Kushalnagar, D. Culler. September 2007. Available from <http://tools.ietf.org/html/rfc4944>

RFC 6282, Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks. Available from <http://tools.ietf.org/html/rfc6282>

RFC 6550, IPv6 Routing Protocol for Low-Power and Lossy Networks, Edited by T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Lewis, K. Pister, R. Struik, JP. Vasseur, R. Alexander. March 2012. Available from <https://tools.ietf.org/html/rfc6550>

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the definitions given in IEC 60050, IEC 62051, IEC 62051-1 as well as the following apply.

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

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>

3.1.1

mesh network

functional unit for the transfer of data between several participants for data processing, via one or a number of redundant transmission paths, whereby each participant is able to pass on data that do not concern themselves to one or more neighbours

3.1.2

Head End System

HES

Central Data System exchanging data via the AMI of various meters in its service area

Note 1 to entry: The HES may communicate via WAN directly to the end devices or via NNAPs and LNAPs.

3.2 Abbreviated terms

AA	Application Association
ACSE	Association Control Service Element
AL	Application Layer
AMI	Advanced Metering Infrastructure
AP	Application Process
ASE	Application Service Element
COSEM	Companion Specification for Energy Metering
DCS	Data Collection System
DHCPv6	Dynamic Host Configuration Protocol for IPv6
DLMS	Device Language Message Specification
DNS	Domain Name System
IP	Internet Protocol
HES	Head End System
HLS	High Level Security mechanism
IANA	Internet Assigned Numbers Authority
LAN	Local Area Network
LN	Local Network
LNAP	Local Network Access Point
MAC	Media Access Control sublayer of the Data Link Layer as specified in the OSI Open Systems Interconnection Model
NN	Neighbourhood Network
NNAP	Neighbourhood Network Access Point
PHY	Physical Layer as specified in the OSI Open Systems Interconnection Model
RF	Radio Frequency
RPL	Routing Protocol for Low-Power and Lossy Networks
SAP	Service Access Point
TCP	Transmission Control Protocol

- UDP User Datagram Protocol
- WAN Wide Area Network
- xDLMS Extended DLMS

4 Targeted communication environments – Overview

The objectives of defining a DLMS/COSEM communication profile for mesh neighbourhood networks are the following:

- a) centralized management of a large number of end devices by a single central Head End System (HES) hosting a (set of) DLMS/COSEM client(s);
- b) efficient end-to-end communication between DLMS/COSEM clients and different kind of devices over Neighbourhood Networks using mesh topology;
- c) reliability and efficiency of accessing devices via the mesh network;
- d) management of adding, removing and relocating devices using existing open standards.

A segment of an AMI network with devices communicating over a mesh network is shown in Figure 1.

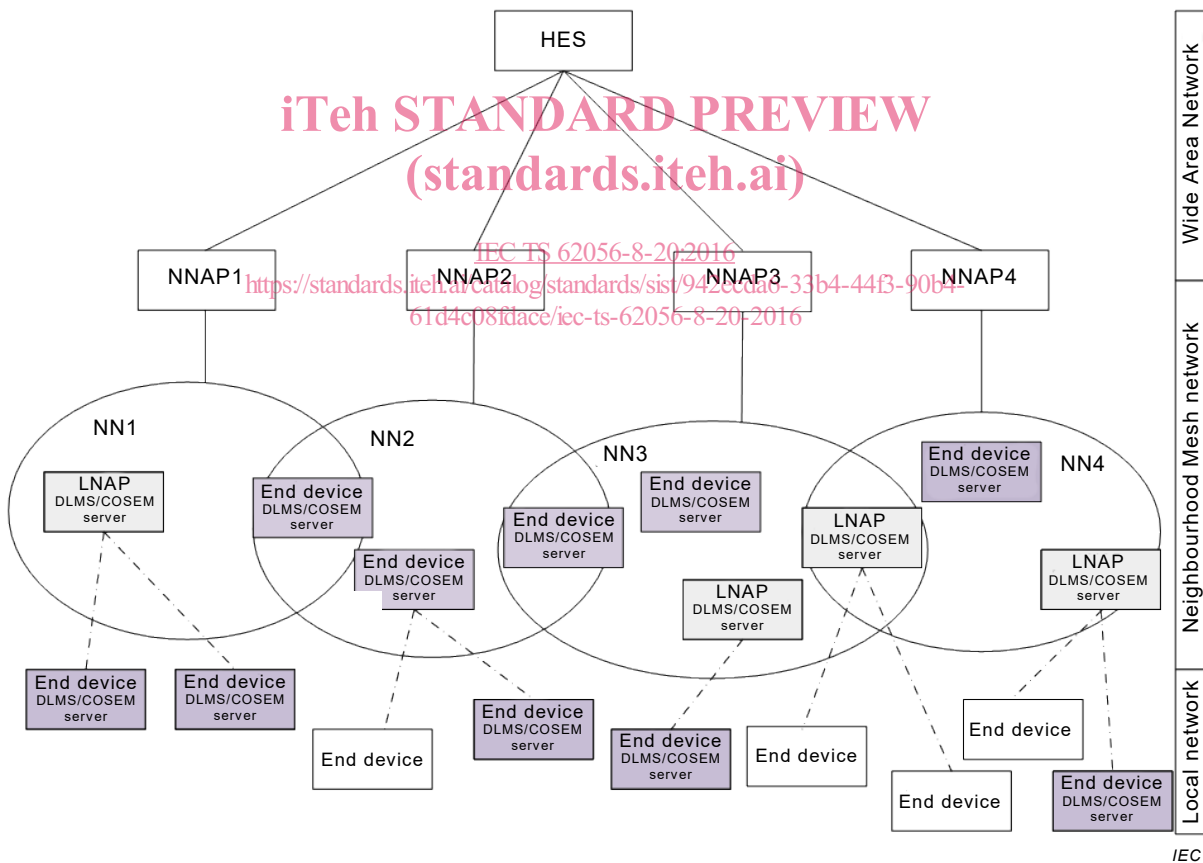


Figure 1 – Mesh neighbourhood network within an AMI environment

Figure 1 depicts a centralized meter data collection and management system.

NOTE 1 It may be managed by a Utility or some other 3rd party entity but this aspect is out of the Scope of this document.

There may be many NNs with a single NNAP each. The NNAP provides access for the HES to the mesh NN. On the one hand, an NNAP has an interface towards the WAN and the NN. On the other hand, it acts as the coordinator of the NN, managing the discovery and registration