IEC TS 62056-9-1

Edition 1.0 2016-05

TECHNICAL SPECIFICATION

colour inside

**Electricity metering data exchange – The DLMS/COSEM suite –
Part 9-1: Communication profile using web-services to access a DLMS/COSEM
server via a COSEM Access Service (CAS)**

IEC TS 62056-9-1:2016-05(en)

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Part 9-1: Communication profile using web-services to access a DLMS/COSEM server via a COSEM Access Service (CAS)

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

IEC TS 62056-9-1, which is a technical specification, has been prepared by IEC 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
13/1641/DTS	13/1662/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 publication 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.

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

* transformed into an International standard,
* reconfirmed,
* withdrawn,
* replaced by a revised edition, or
* amended.

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ELECTRICITY METERING DATA EXCHANGE –
THE DLMS/COSEM SUITE –

Part 9-1: Communication profile using web-services to access
a DLMS/COSEM server via a COSEM Access Service (CAS)

1 Scope

This part of IEC 62056, which is a Technical Specification, defines how DLMS/COSEM servers can be accessed from a COSEM Access Client via an intermediate COSEM Access Service (CAS) providing Web services. The DLMS/COSEM server contains an application server supporting the data model of IEC 62056-6-1 / IEC 62056-6-2 and the application layer of IEC 62056-5-3. The underlying communication layers between the CAS and the DLMS/COSEM server are not covered by this specification. However, it is assumed that a profile standard exists describing how the underlying communication technology is used in conjunction with IEC 62056-6-1/ IEC 62056-6-2 and IEC 62056-5-3.

The Web services defined in this Technical Specification concern the G2 interface according to the architecture defined in IEC 62056-1-0.

The contents of this document define the Web services between the COSEM Access Client and the COSEM Access Service (CAS) as shown in Figure 1.
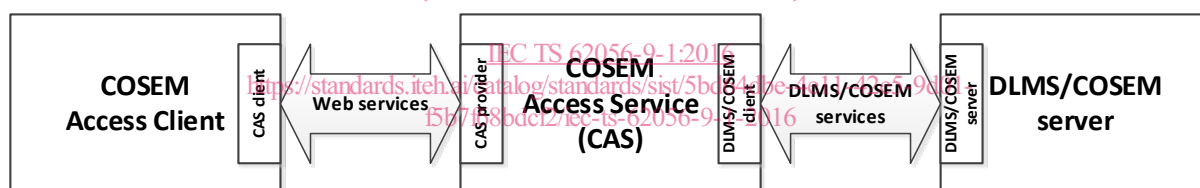
Figure 1 – Reference model for the COSEM Access Client to DLMS/COSEM server connection via a COSEM Access Service

The COSEM Access Client identifies the DLMS/COSEM server by its system title (see IEC 62056-5-3).

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 61968-1:2012, *Application integration at electric utilities – System interfaces for distribution management – Part 1: Interface architecture and general recommendations*

IEC 61968-100:2013, *Application integration at electric utilities – System interfaces for distribution management – Part 100: Implementation profiles*

IEC 62056-1-0, *Electricity metering data exchange – Part 1-0: Smart metering standardization framework*

IEC 62056-5-3, *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 62056-8-3, *Electricity metering data exchange – The DLMS/COSEM suite – Part 8-3: Communication profile for PLC S-FSK neighbourhood networks*

3   Terms, definitions and abbreviations

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

|	
ACSE	Association Control Service Element
APDU	Application Layer Protocol Data Unit
CAC	COSEM Access Client
CAS	COSEM Access Service
CAS Provider	Interface providing Web services to access the CAS
CME	Common Message Envelope
COSEM	Companion Specification for Energy Metering
COSEM Access Client	Client accessing the DLMS/COSEM server via the COSEM Access Service CAS
COSEM Access Service	Service entity providing Web service based COSEM access towards the COSEM Access Client and acting as a DLMS/COSEM client towards the DLMS/COSEM server
DLMS	Device Language Message Specification
DLMS/COSEM server	DLMS/COSEM server supporting the data models of IEC 62056-6-1 / IEC 62056-6-2 and the application layer of IEC 62056-5-3
HES	Head End System, also known as Data Collection System
IP	Internet Protocol
ISO	International Organization for Standardization
mRID	CIM master resource identifier
NN	Neighbourhood Network
NNAP	Neighbourhood Network Access Point
REST	REpresentational State Transfer
SOAP	Simple Object Access Protocol
UUID	Universal Unique Identifier
WAN	Wide area network
WS	Web services
WSDL	Web Services Definition Language
xDLMS	Extended DLMS
XML	eXtensible Markup Language
XSD	XML Schema

4   Relation to the IEC 62056 smart metering architecture

4.1   Overview

Considering the smart metering architecture introduced in IEC 62056-1-0 the abstract model of Figure 2 covers the communication between the HES and the NNAP as shown in Figure 2. Where the HES acts as COSEM Access Client, the NNAP provides the COSEM Access Service (CAS) and the DLMS/COSEM server corresponds to the metering device. The Web services defined in this TS concern the G2 interface. Typically, the communication technology used in the NN is not the same as the communication technology used in the WAN; i.e. the NN does not necessarily support IP based communication.

4.2   Example: Using the S-FSK profile according to IEC 62056-8-3

When the S-FSK PLC profile is used between the NNAP (CAS) and the metering device (DLMS/COSEM server), the system titles of the NNAP and the metering device are exchanged during the registration process using the CIASE protocol. In this case the information of the system titles shall be made available to the HES (COSEM Access Client) prior to the establishment of any communication with the metering device.
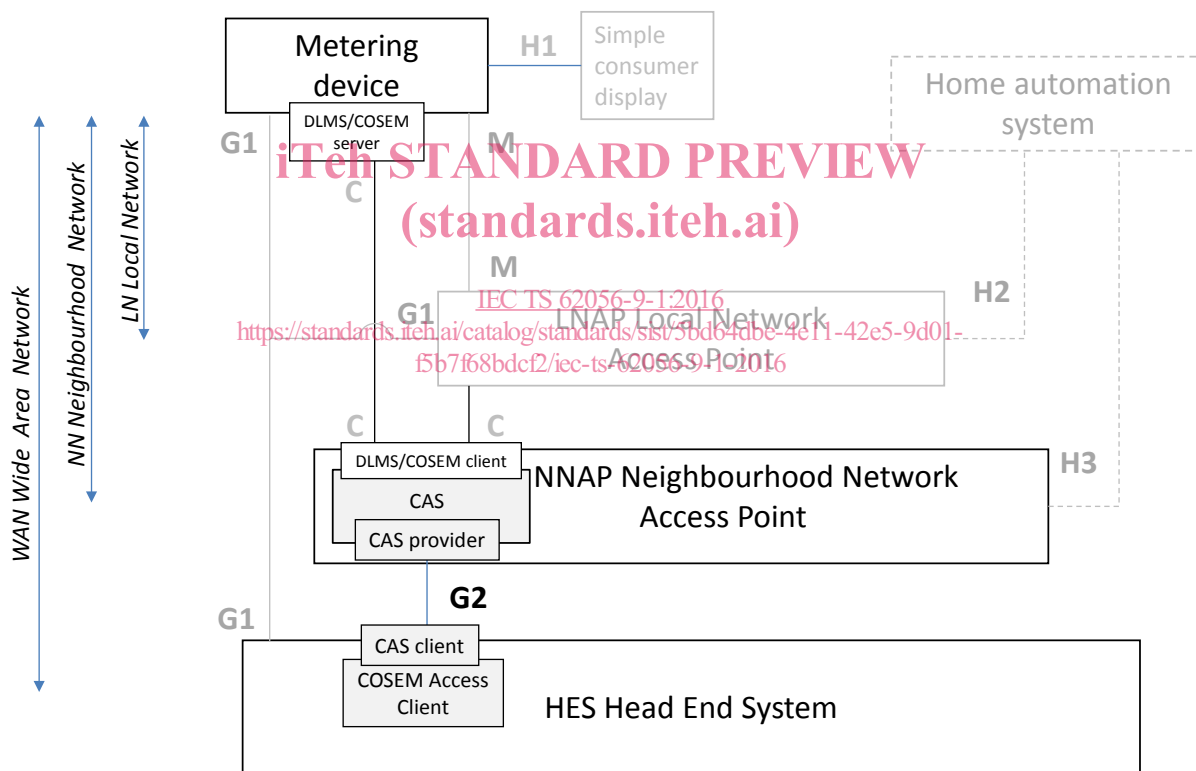
Figure 2 – The smart metering architecture of IEC 62056

5   Use cases

5.1   General

The use cases defined in the following subclauses are based on the reference model of Figure 1; i.e. the use cases concern the messaging for the data exchange between a COSEM Access Client and a DLMS/COSEM server via a CAS; the use cases cover the data exchange processes between the actors involved. The use cases for the applications to support the smart metering business processes are not considered.

The following actors are considered (see Figure 1):

- COSEM Access Client;

- COSEM Access Service;

- DLMS/COSEM server.

The use cases are supported by 3 generic types of messages (supporting the data exchange processes) exchanged between the COSEM Access Client and the COSEM Access Service:

- WS-Request();

- WS-Response();

- WS-Event().

The COSEM Access Client issues a request by sending a WS-Request message to the COSEM Access Service. The COSEM Access Service in return sends WS-Response messages or WS-Event messages to the COSEM Access Client. The COSEM Access Client expects one of the following results from the issued request:

- the request is successfully processed and a WS-Response message is returned in a timely manner;

- the request is accepted, but results in a WS-Response message that returns an application level error code or a fault;

- the request is accepted, the WS-Response message is returned and the results are sent asynchronously to COSEM Access Client by means of WS-Event messages.

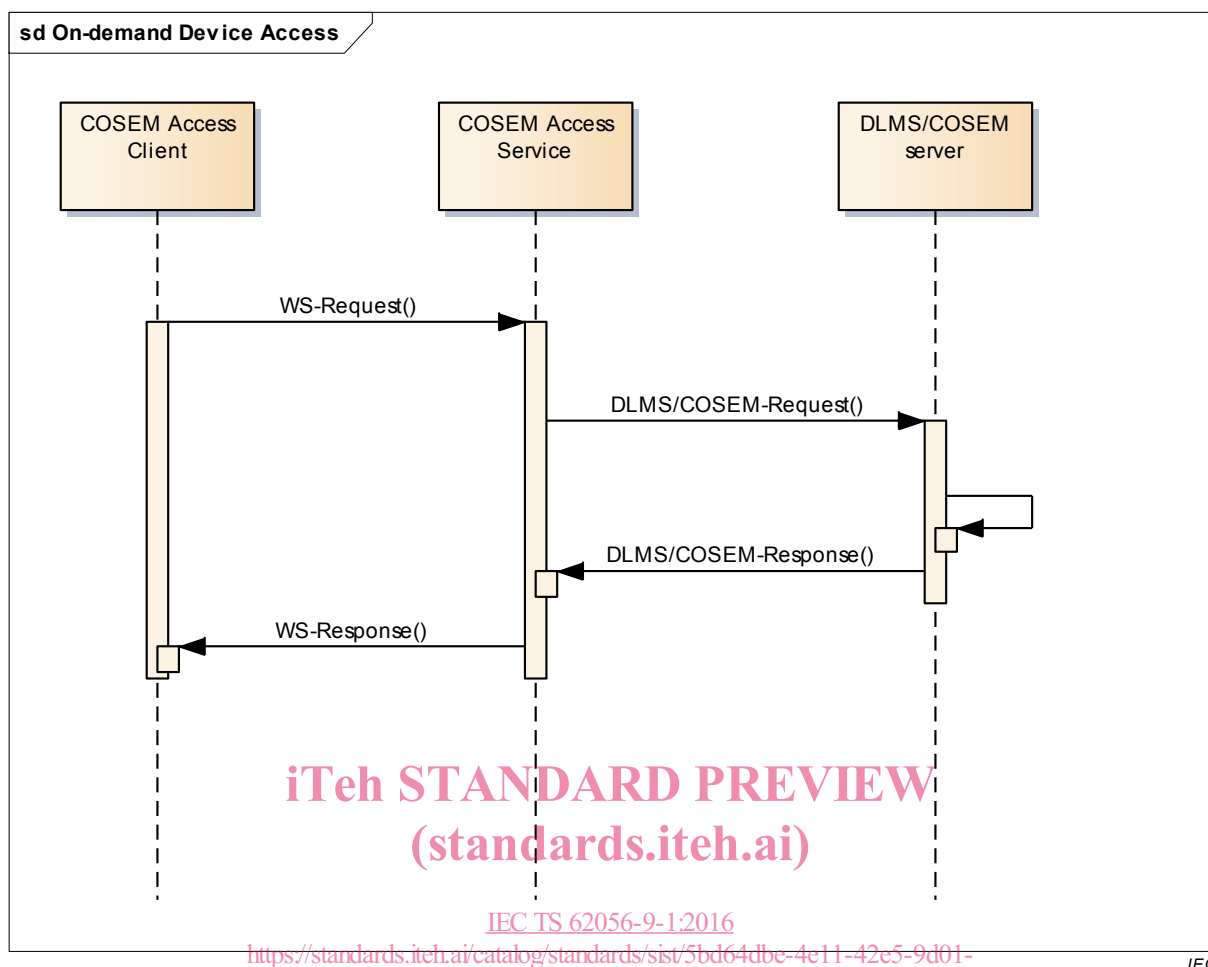## 5.2   Use case: Device Access

5.2.1   Overview

The COSEM Access Client requests to access a set of COSEM objects in a set of DLMS/COSEM servers.

The data exchange is initiated and managed by the COSEM Access Client using the standardised services and processes defined in IEC 62056-5-3. In particular, the COSEM Access Client assembles the DeviceAccess messages which encapsulate the corresponding xDLMS APDUs. The DeviceAccess messages are transmitted to the COSEM Access Service for processing and transmission to the DLMS/COSEM servers. Processing involves on-demand or scheduled activation of exchanges with DLMS/COSEM servers and providing the results of this exchange. For that purpose the COSEM Access Client uses the Web services provided by the WS Provider in the COSEM Access Service.

5.2.2   On-demand Device Access

5.2.2.1   Overview

The requests are executed immediately by the CAS. Upon availability, the results are made available by the CAS via Web services. The corresponding message sequence diagram is shown in Figure 3.

sd On-demand Device Access

WS-Request()

DLMS/COSEM-Request()

DLMS/COSEM-Response()

WS-Response()

IEC

Figure 3 – Use case: On-demand Device Access

5.2.2.2 Parameters

On demand access is defined by the following parameters:

DevicesReferenceList (mandatory element):

Specifies the list of DLMS/COSEM servers which need to be accessed via the CAS. Besides the identification of the physical device the DeviceReferenceList also contains the identification of the logical device of the server.

CosemAccessList (mandatory element):

Specifies the list of COSEM services to be invoked in the DLMS/COSEM servers defined in DevicesReferenceList.

Activates (optional element):

For on-demand access the element *Activates* (optional element) is omitted, meaning that this service is immediately activated.

NotOlderThan (optional element):

Any result from the DLMS/COSEM servers invoked by the CAS which is older than "NotOlderThan" will no more be available at the CAS Provider.

Priority (optional element):

Defines the priority with which the CAS has to invoke the COSEM services listed in the COSEMAccessList.

Expires (optional element):

Specifies the date and time when the CAS has to stop invoking the services listed in the CosemAccessList.

5.2.2.3   Result

The result from the DLMS/COSEM server shall be delivered to the CAS Provider interface upon availability. The result may be notified, directly transmitted to the COSEM Access Client or queried by the COSEM Access Client. Only data which is "NotOlderThan" can be successfully queried. Once delivered to the COSEM Access Client the result may not be available in the CAS anymore.

The result of an "on-demand access" has the following form:

**OnDemandDeviceAccess/CosemAccessList/CosemAccess[0..n]/CosemAccessResult[0...n]**

Any error message shall contain sufficient information to locate the source of the error. In particular three error locations shall be distinguished:

* to report errors on the DLMS/COSEM server level the CosemAccessResult is according to COSEM APDU definitions in IEC 62056-5-3;

* to report errors on the communication between the DLMS/COSEM client interface of the CAS and the DLMS/COSEM server the CosemAccessResult is extended according to 7.2.6.1.4;

* to report errors on the CAS level the CosemAccessResult is extended according to 7.2.6.1.4.

5.2.3   Scheduled Device Access

5.2.3.1   Overview

The execution time of the access to the DLMS/COSEM server by the CAS can be defined by means of the "*Activates*" parameter. In particular, the execution may be performed once at a specific point of time or the execution may be repeated several times. The corresponding message sequence diagrams are shown in Figure 4 and Figure 5.
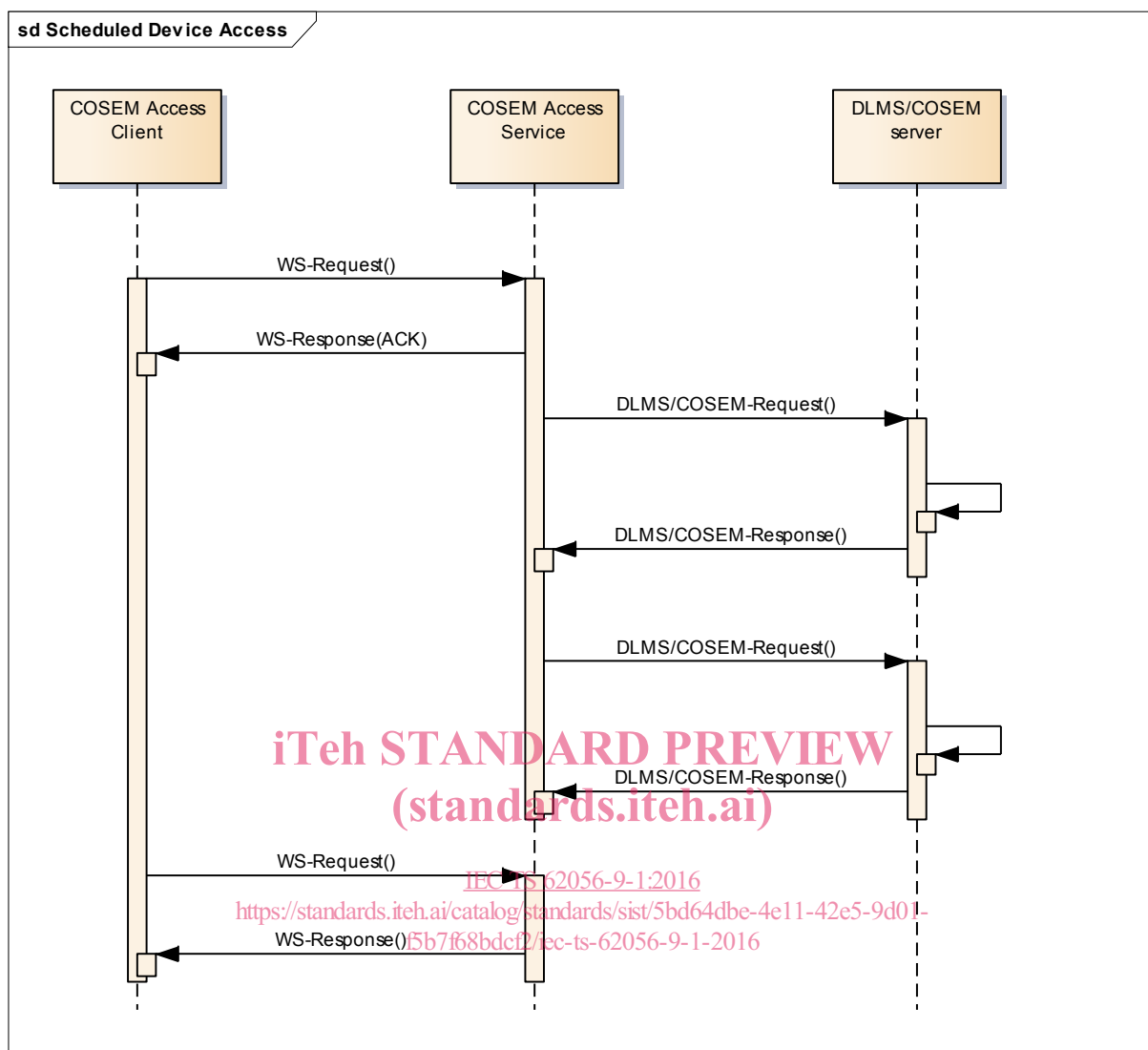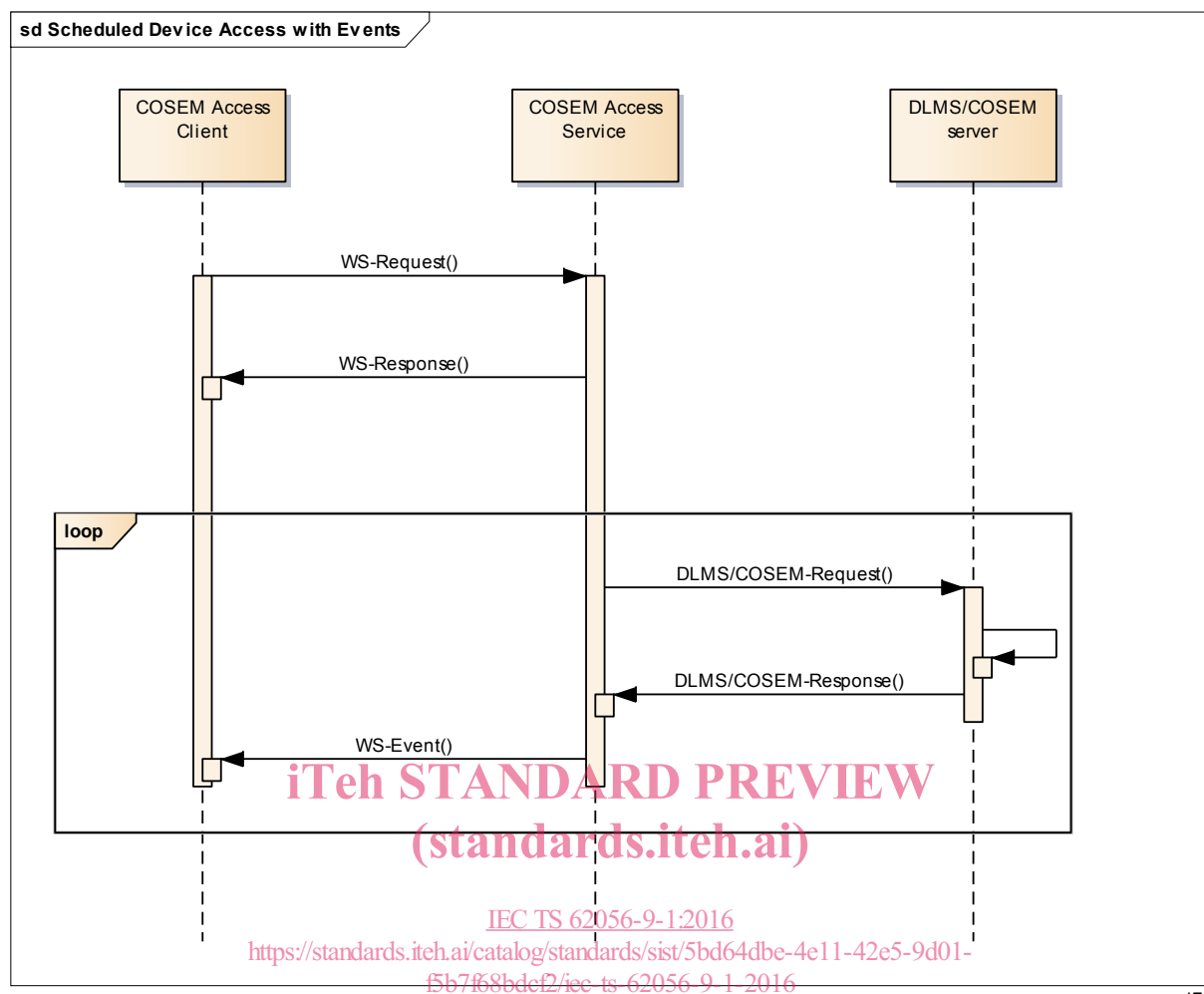
Figure 4 – Use case: Scheduled Device Access

The use case Scheduled Device Access message exchange consists of the following process:

- the COSEM Access Client issues a request by sending a WS-Request message to COSEM Access Service;

- the COSEM Access Service in return sends a WS-Response message acknowledging the request to COSEM Access Client;

- the COSEM Access Service issues DLMS/COSEM-Request messages to the DLMS/COSEM server according to the defined schedule and then processes the DLMS/COSEM-Response messages received from COSEM server;

- the COSEM Access Client issues a request by sending a WS-Request message to the COSEM Access Service requesting the results of the scheduled DLMS/COSEM requests;

- the COSEM Access Service sends a WS-Response message with the results of the scheduled DLMS/COSEM requests to the COSEM Access Client.

Figure 5 – Use case: Scheduled Device Access with Events

The use case Scheduled Device Access with Events message exchange consists of the following process:

- the COSEM Access Client issues a request by sending a WS-Request message to the COSEM Access Service;

- the COSEM Access Service in return sends a WS-Response message acknowledging the request to the COSEM Access Client;

- the COSEM Access Service issues DLMS/COSEM-Request messages to the DLMS/COSEM server according to defined schedule;

- the COSEM Access Service processes the DLMS/COSEM-Response messages and sends WS-Event messages to the COSEM Access Client.

5.2.3.2   Parameters

Scheduled access uses the parameters listed in 5.2.2.2. For scheduled access the parameter "Activates" becomes a mandatory element defining the details of the access schedule.

Activates (mandatory element)

Specifies the date and time when the CAS has to invoke the services listed in the CosemAccessList. Start time, period, end time, validity window, according to the Schedule (ISO 8601).