**9.5 Abstract syntax of COSEM APDUs**

The abstract syntax of COSEM APDUs is specified in this subclause 9.5 using ASN.1. See ISO/IEC 8824.

NOTE The CIASE APDUs are specified in 10.4.9.

COSEMpdu DEFINITIONS ::= BEGIN

**ACSE-APDU** ::= CHOICE

*-- Association Control Service Element, ACSE*

{

aarq **AARQ**-apdu,

aare **AARE**-apdu,

rlrq RLRQ-apdu, -- OPTIONAL

rlre RLRE-apdu -- OPTIONAL

}

**XDLMS-APDU** ::= CHOICE

{

-- ***standardised*** xDLMS pdus ***used in DLMS/COSEM***

-- ***with no ciphering***

initiateRequest [1] IMPLICIT InitiateRequest,

readRequest [**5**] IMPLICIT **ReadRequest**,

writeRequest [**6**] IMPLICIT **WriteRequest**,

initiateResponse [8] IMPLICIT InitiateResponse,

readResponse [**12**] IMPLICIT **ReadResponse**,

writeResponse [**13**] IMPLICIT **WriteResponse**,

confirmedServiceError [14] ConfirmedServiceError,

-- data-notification

data-notification [15] IMPLICIT Data-Notification,

unconfirmedWriteRequest [22] IMPLICIT UnconfirmedWriteRequest,

informationReportRequest [24] IMPLICIT InformationReportRequest,

-- The APDU tag of each ciphered xDLMS APDU indicates the type of the unciphered APDU and whether

-- global or dedicated key is used. The type of the key is carried by the security header, and after

-- removing the encryption and/or verifying the authentication tag, the original APDU with its APDU

-- TAG is restored. Therefore, the APDU tags of the ciphered APDUs carry redundant information, but

-- they are retained for consistency.

-- with global ciphering

glo-initiateRequest [33] IMPLICIT OCTET STRING,

glo-readRequest [37] IMPLICIT OCTET STRING,

glo-writeRequest [38] IMPLICIT OCTET STRING,

glo-initiateResponse [40] IMPLICIT OCTET STRING,

glo-readResponse [44] IMPLICIT OCTET STRING,

glo-writeResponse [45] IMPLICIT OCTET STRING,

glo-confirmedServiceError [46] IMPLICIT OCTET STRING,

glo-unconfirmedWriteRequest [54] IMPLICIT OCTET STRING,

glo-informationReportRequest [56] IMPLICIT OCTET STRING,

-- with dedicated ciphering

-- not used in DLMS/COSEM

ded-initiateRequest [65] IMPLICIT OCTET STRING,

ded-readRequest [69] IMPLICIT OCTET STRING,

ded-writeRequest [70] IMPLICIT OCTET STRING,

-- not used in DLMS/COSEM

ded-initiateResponse [72] IMPLICIT OCTET STRING,

ded-readResponse [76] IMPLICIT OCTET STRING,

ded-writeResponse [77] IMPLICIT OCTET STRING,

ded-confirmedServiceError [78] IMPLICIT OCTET STRING,

ded-unconfirmedWriteRequest [86] IMPLICIT OCTET STRING,

ded-informationReportRequest [88] IMPLICIT OCTET STRING,

-- xDLMS APDUs ***used with LN referencing***

-- ***with no ciphering***

get-request [**192**] IMPLICIT **Get-Request**,

set-request [193] IMPLICIT Set-Request,

event-notification-request [194] IMPLICIT EventNotificationRequest,

action-request [195] IMPLICIT Action-Request,

get-response [**196**] IMPLICIT Get-Response,

set-response [197] IMPLICIT Set-Response,

action-response [199] IMPLICIT Action-Response,

-- with global ciphering

glo-get-request [200] IMPLICIT OCTET STRING,

glo-set-request [201] IMPLICIT OCTET STRING,

glo-event-notification-request [202] IMPLICIT OCTET STRING,

glo-action-request [203] IMPLICIT OCTET STRING,

glo-get-response [204] IMPLICIT OCTET STRING,

glo-set-response [205] IMPLICIT OCTET STRING,

glo-action-response [207] IMPLICIT OCTET STRING,

-- with dedicated ciphering

ded-get-request [208] IMPLICIT OCTET STRING,

ded-set-request [209] IMPLICIT OCTET STRING,

ded-event-notification-request [210] IMPLICIT OCTET STRING,

ded-actionRequest [211] IMPLICIT OCTET STRING,

ded-get-response [212] IMPLICIT OCTET STRING,

ded-set-response [213] IMPLICIT OCTET STRING,

ded-action-response [215] IMPLICIT OCTET STRING,

-- the exception response pdu

exception-response [216] IMPLICIT ExceptionResponse,

-- access

access-request [217] IMPLICIT Access-Request,

access-response [218] IMPLICIT Access-Response,

-- general APDUs

general-glo-ciphering [219] IMPLICIT General-Glo-Ciphering,

general-ded-ciphering [220] IMPLICIT General-Ded-Ciphering,

general-ciphering [221] IMPLICIT General-Ciphering,

general-signing [223] IMPLICIT General-Signing,

general-block-transfer [224] IMPLICIT General-Block-Transfer

-- The tags 230 and 231 are reserved for DLMS Gateway

-- reserved [230]

-- reserved [231]

}

**AARQ** ::= **[APPLICATION 0]** IMPLICIT SEQUENCE

{

-- [APPLICATION 0] == [ **60**H ] = [ 96 ]

protocol-version [0] IMPLICIT BIT STRING {version1 (0)} DEFAULT {version1},

application-context-name [**1**] Application-context-name, ***A1***

called-AP-title [2] AP-title OPTIONAL,

called-AE-qualifier [3] AE-qualifier OPTIONAL,

called-AP-invocation-id [4] AP-invocation-identifier OPTIONAL,

called-AE-invocation-id [5] AE-invocation-identifier OPTIONAL,

calling-AP-title [**6**] AP-title OPTIONAL, ***A6***

calling-AE-qualifier [7] AE-qualifier OPTIONAL,

calling-AP-invocation-id [8] AP-invocation-identifier OPTIONAL,

calling-AE-invocation-id [9] AE-invocation-identifier OPTIONAL,

-- The following field shall not be present if only the kernel is used.

sender-acse-requirements [**10**] IMPLICIT ACSE-requirements OPTIONAL, ***8A***

-- The following field shall only be present if the authentication functional unit is selected.

mechanism-name [**11**] IMPLICIT Mechanism-name OPTIONAL, ***8B***

-- The following field shall only be present if the authentication functional unit is selected.

calling-authentication-value [**12**] EXPLICIT Authentication-value OPTIONAL, ***AC***

implementation-information [29] IMPLICIT Implementation-data OPTIONAL,

user-information [**30**] EXPLICIT Association-information OPTIONAL ***BE***

}

-- The user-information field shall carry an InitiateRequest APDU encoded in A-XDR, and then

-- encoding the resulting OCTET STRING in BER.

**AARE**-apdu ::= **[APPLICATION 1]** IMPLICIT SEQUENCE

{

-- [APPLICATION 1] == [ **61**H ] = [ 97 ]

protocol-version [0] IMPLICIT BIT STRING {version1 (0)} DEFAULT {version1},

application-context-name [1] Application-context-name,

result [2] Association-result,

result-source-diagnostic [3] Associate-source-diagnostic,

responding-AP-title [4] AP-title OPTIONAL,

responding-AE-qualifier [5] AE-qualifier OPTIONAL,

responding-AP-invocation-id [6] AP-invocation-identifier OPTIONAL,

responding-AE-invocation-id [7] AE-invocation-identifier OPTIONAL,

-- The following field shall not be present if only the kernel is used.

responder-acse-requirements [8] IMPLICIT ACSE-requirements OPTIONAL,

-- The following field shall only be present if the authentication functional unit is selected.

mechanism-name [9] IMPLICIT Mechanism-name OPTIONAL,

-- The following field shall only be present if the authentication functional unit is selected.

responding-authentication-value [10] EXPLICIT Authentication-value OPTIONAL,

implementation-information [29] IMPLICIT Implementation-data OPTIONAL,

user-information [30] EXPLICIT Association-information OPTIONAL

}

-- The user-information field shall carry either an InitiateResponse (or, when the proposed xDLMS

-- context is not accepted by the server, a confirmedServiceError) APDU encoded in A-XDR, and then

-- encoding the resulting OCTET STRING in BER.

**ReadRequest** ::= SEQUENCE OF Variable-Access-Specification

**ReadResponse** ::= SEQUENCE OF CHOICE

{

data [0] Data,

data-access-error [1] IMPLICIT Data-Access-Result,

data-block-result [2] IMPLICIT Data-Block-Result,

block-number [3] IMPLICIT Unsigned16

}

**WriteRequest** ::= SEQUENCE

{

variable-access-specification SEQUENCE OF Variable-Access-Specification,

list-of-data SEQUENCE OF Data

}

**WriteResponse** ::= SEQUENCE OF CHOICE

{

success [0] IMPLICIT NULL,

data-access-error [1] IMPLICIT Data-Access-Result,

block-number [2] Unsigned16

}

**Data-Block-Result** ::= SEQUENCE -- *Used in ReadResponse with block transfer*

{

last-block BOOLEAN,

block-number Unsigned16,

raw-data OCTET STRING

}

-- COSEM APDUs using logical name referencing

**Get-Request** ::= CHOICE

{

get-request-normal [1] IMPLICIT Get-Request-Normal,

get-request-next [2] IMPLICIT Get-Request-Next,

get-request-with-list [3] IMPLICIT Get-Request-With-List

}

**Get-Request-Normal** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

cosem-attribute-descriptor Cosem-Attribute-Descriptor,

access-selection Selective-Access-Descriptor OPTIONAL

}

**Get-Request-Next** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

block-number Unsigned32

}

**Get-Request-With-List** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

attribute-descriptor-list SEQUENCE OF Cosem-Attribute-Descriptor-With-Selection

}

**Get-Response** ::= CHOICE

{

get-response-normal [1] IMPLICIT Get-Response-Normal,

get-response-with-datablock [2] IMPLICIT Get-Response-With-Datablock,

get-response-with-list [3] IMPLICIT Get-Response-With-List

}

**Get-Response-Normal** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

result Get-Data-Result

}

**Get-Response-With-Datablock** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

result DataBlock-G

}

**Get-Response-With-List** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

result SEQUENCE OF Get-Data-Result

}

**Set-Request** ::= CHOICE

{

set-request-normal [1] IMPLICIT Set-Request-Normal,

set-request-with-first-datablock [2] IMPLICIT Set-Request-With-First-Datablock,

set-request-with-datablock [3] IMPLICIT Set-Request-With-Datablock,

set-request-with-list [4] IMPLICIT Set-Request-With-List,

set-request-with-list-and-first-datablock [5] IMPLICIT Set-Request-With-List-And-First-Datablock

}

**Set-Request-Normal** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

cosem-attribute-descriptor Cosem-Attribute-Descriptor,

access-selection Selective-Access-Descriptor OPTIONAL,

value Data

}

**Set-Request-With-First-Datablock** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

cosem-attribute-descriptor Cosem-Attribute-Descriptor,

access-selection [0] IMPLICIT Selective-Access-Descriptor OPTIONAL,

}

**Set-Request-With-Datablock** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

datablock DataBlock-SA

}

**Set-Request-With-List** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

attribute-descriptor-list SEQUENCE OF Cosem-Attribute-Descriptor-With-Selection,

value-list SEQUENCE OF Data

}

**Set-Request-With-List-And-First-Datablock** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

attribute-descriptor-list SEQUENCE OF Cosem-Attribute-Descriptor-With-Selection,

datablock DataBlock-SA

}

**Set-Response** ::= CHOICE

{

set-response-normal [1] IMPLICIT Set-Response-Normal,

set-response-datablock [2] IMPLICIT Set-Response-Datablock,

set-response-last-datablock [3] IMPLICIT Set-Response-Last-Datablock,

set-response-last-datablock-with-list [4] IMPLICIT Set-Response-Last-Datablock-With-List,

set-response-with-list [5] IMPLICIT Set-Response-With-List

}

**Set-Response-Normal** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

result Data-Access-Result

}

**Set-Response-Datablock** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

block-number Unsigned32

}

**Set-Response-Last-Datablock** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

result Data-Access-Result,

block-number Unsigned32

}

**Set-Response-Last-Datablock-With-List** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

result SEQUENCE OF Data-Access-Result,

block-number Unsigned32

}

**Set-Response-With-List** ::= SEQUENCE

{

invoke-id-and-priority Invoke-Id-And-Priority,

result SEQUENCE OF Data-Access-Result

}