

DIN EN 61158-6-17

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Ersatzvermerk
siehe unten

**Industrielle Kommunikationsnetze –
Feldbusse –
Teil 6-17: Protokollspezifikation des Application Layer
(Anwendungsschicht) – Typ 17-Elemente (IEC 61158-6-17:2007);
Englische Fassung EN 61158-6-17:2008, nur auf CD-ROM**

Industrial communication networks –

Fieldbus specifications –

Part 6-17: Application layer protocol specification – Type 17 elements
(IEC 61158-6-17:2007);

English version EN 61158-6-17:2008, only on CD-ROM

Réseaux de communication industriels –

Spécifications des bus de terrain –

Partie 6-17: Spécification des services des couches d'application – Eléments de type 17
(CEI 61158-6-17:2007);

Version anglaise EN 61158-6-17:2008, seulement en CD-ROM

Ersatzvermerk

Mit DIN EN 61158-6-2:2008-09, DIN EN 61158-6-3:2008-09, DIN EN 61158-6-4:2008-09,
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DIN EN 61158-6-19:2008-09 und DIN EN 61158-6-20:2008-09 Ersatz für DIN EN 61158-6:2005-05
Siehe jedoch Beginn der Gültigkeit

Gesamtumfang 75 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Beginn der Gültigkeit

Die von CENELEC am 2008-02-01 angenommene EN 61158-6-17 gilt als DIN-Norm ab 2008-09-01.

Daneben darf DIN EN 61158-6:2005-05 noch bis 2011-02-01 angewendet werden.

Nationales Vorwort

Mit DIN EN 61158-6-2:2008-09, DIN EN 61158-6-3:2008-09, DIN EN 61158-6-4:2008-09, DIN EN 61158-6-5:2008-09, DIN EN 61158-6-7:2008-09, DIN EN 61158-6-8:2008-09, DIN EN 61158-6-9:2008-09, DIN EN 61158-6-10:2008-09, DIN EN 61158-6-11:2008-09, DIN EN 61158-6-12:2008-09, DIN EN 61158-6-13:2008-09, DIN EN 61158-6-14:2008-09, DIN EN 61158-6-15:2008-09, DIN EN 61158-6-16:2008-09, DIN EN 61158-6-18:2008-09, DIN EN 61158-6-19:2008-09 und DIN EN 61158-6-20:2008-09 Ersatz für DIN EN 61158-6:2005-05.

Vorausgegangener Norm-Entwurf: E DIN EN 61158-600:2006-11.

Für diese Norm ist das nationale Arbeitsgremium K 956 „Feldbus“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE (www.dke.de) zuständig.

Die enthaltene IEC-Publikation wurde vom SC 65C „Industrial networks“ erarbeitet.

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

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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.

Einführung

Ein Feldbus ist ein digitaler serieller Datenbus für die Kommunikation zwischen Geräten der industriellen Automatisierungstechnik wie beispielsweise Messeinrichtungen, Stellgliedern, Reglern und speicherprogrammierbaren Steuerungen. Die Normen der Reihe DIN EN 61158 legen eine Anzahl von Feldbus-Protokolltypen fest.

Die vorliegende Norm legt das Protokoll des Application Layer für einen Feldbus des Typs 17 (Vnet/IP) fest. Dieser war in den unten aufgeführten früheren Ausgaben nicht enthalten.

Erklärung zu Schutzrechten

Die Internationale Elektrotechnische Kommission macht darauf aufmerksam, dass ihr gegenüber erklärt wurde, dass die Übereinstimmung mit dem vorgesehenen Norm-Inhalt die Anwendung von Patenten erforderlich machen könnte. Nähere Informationen hierzu befinden sich im Vorwort der Europäischen Norm.

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Gegenüber DIN EN 61158-6:2005-05 wurden folgende Änderungen vorgenommen:

- a) Streichung des Typ 6-Feldbusses wegen zu geringer Marktbedeutung;
- b) Hinzufügung von weiteren Feldbustypen;
- c) Aufteilung in mehrere Teile, jeweils als 6-2, 6-3, ..., 6-20 benummert.

Frühere Ausgaben

DIN V 19245-1: 1988-01
DIN 19245-1: 1991-04
DIN 19245-2: 1991-04
DIN EN 50170-1: 1997-07
DIN EN 50170-2: 1997-07
DIN EN 50170-3: 1997-07
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DIN EN 50170/A1: 2002-11
DIN EN 50170/A2: 2000-08
DIN EN 50170/A3: 2002-11
DIN EN 61158-6: 2005-05

– Leerseite –

Deutsche Fassung

Industrielle Kommunikationsnetze –
Feldbusse –
Teil 6-17: Protokollspezifikation des Application Layer (Anwendungsschicht) –
Typ 17-Elemente
(IEC 61158-6-17:2007)

Industrial communication networks –
Fieldbus specifications –
Part 6-17: Application layer protocol specification –
Type 17 elements
(IEC 61158-6-17:2007)

Réseaux de communication industriels –
Spécifications des bus de terrain –
Partie 6-17: Spécification des services des
couches d'application – Eléments de type 17
(CEI 61158-6-17:2007)

Diese Europäische Norm wurde von CENELEC am 2008-02-01 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.

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CENELEC

Europäisches Komitee für Elektrotechnische Normung
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique

Zentralsekretariat: rue de Stassart 35, B-1050 Brüssel

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Ref. Nr. EN 61158-6-17:2008 D

Vorwort

Der Text des Schriftstücks 65C/476/FDIS, zukünftige 1. Ausgabe von IEC 61158-6-17, ausgearbeitet von dem SC 65C „Industrial networks“ des IEC/TC 65 „Industrial-process measurement, control and automation“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2008-02-01 als EN 61158-6-17 angenommen.

Dieser und die weiteren Teile der Normenreihe EN 61158-6 ersetzen EN 61158-6:2004.

Gegenüber EN 61158-6:2004 wurden die folgenden Änderungen durchgeführt:

- Streichung des Typ 6-Feldbusses wegen zu geringer Marktbedeutung;
- Hinzufügung von weiteren Feldbustypen;
- Aufteilung in mehrere Teile, jeweils als 6-2, 6-3, ..., 6-20 benummert.

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Typ 17:

PCT Application No. PCT/JP2004/011537 [YEC] Communication control method

PCT Application No. PCT/JP2004/011538 [YEC] Communication control method

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Der Anhang ZA wurde von CENELEC hinzugefügt.

Anerkennungsnotiz

Der Text der Internationalen Norm IEC 61158-6-17:2007 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

In der offiziellen Fassung sind unter „Literaturhinweise“ zu den aufgelisteten Normen die nachstehenden Anmerkungen einzutragen:

IEC 61158-3-17 ANMERKUNG Harmonisiert als EN 61158-3-17:2008 (nicht modifiziert).

IEC 61158-4-17 ANMERKUNG Harmonisiert als EN 61158-4-17:2008 (nicht modifiziert).

IEC 61784-1 ANMERKUNG Harmonisiert als EN 61784-1:2008 (nicht modifiziert).

IEC 61784-2 ANMERKUNG Harmonisiert als EN 61784-2:2008 (nicht modifiziert).

CONTENTS

INTRODUCTION	7
1 Scope	8
1.1 General	8
1.2 Specifications	8
1.3 Conformance	8
2 Normative reference	9
3 Definitions	9
3.1 Terms and definitions	9
3.2 Abbreviations and symbols	15
3.3 Conventions	16
4 Abstract syntax description	18
4.1 FAL PDU abstract syntax	18
4.2 Abstract syntax of PDU body	18
4.3 PDUs for ASEs	20
4.4 Type definitions	23
4.5 Data types	26
5 Transfer syntax	28
5.1 Overview of encoding	28
5.2 APDU header encoding	28
5.3 APDU body encoding	29
5.4 Data type encoding rules	30
6 FAL protocol state machines structure	34
7 AP-context state machine	35
8 FAL service protocol machines (FSPMs)	35
8.1 General	35
8.2 Common parameters of the primitives	35
8.3 Variable ASE protocol machine (VARM)	36
8.4 Event ASE protocol machine (EVTM)	39
8.5 Load region ASE protocol machine (LDRM)	41
8.6 Function invocation ASE protocol machine (FNIM)	43
8.7 Time ASE protocol machine (TIMM)	47
8.8 Network management ASE protocol machine (NWMM)	51
9 Application relationship protocol machines (ARPMs)	55
9.1 General	55
9.2 Primitive definitions	55
9.3 State machine	56
9.4 Functions	65
10 DLL mapping protocol machine (DMPM)	65
10.1 General	65
10.2 Primitive definitions	66
10.3 DMPM state machine	67
Bibliography	70
Annex ZA (normative) Normative references to international publications with their corresponding European publications	71
Figure 1 – APDU overview	28

Figure 2 – Type field	29
Figure 3 – Identifier octet	29
Figure 4 – Length octet (one-octet format)	30
Figure 5 – Length octets (three-octet format)	30
Figure 6 – Relationships among protocol machines and adjacent layers	34
Figure 7 – State transition diagram of VARM	36
Figure 8 – State transition diagram of EVTM	40
Figure 9 – State transition diagram of LDRM	42
Figure 10 – State transition diagram of FNIM	44
Figure 11 – State transition diagram of TIMM	48
Figure 12 – State transition diagram of NWMM	52
Figure 13 – State transition diagram of the PTC-ARPM	57
Figure 14 – State transition diagram of the PTU-ARPM	59
Figure 15 – State transition diagram of the PSU-ARPM	60
Figure 16 – State transition diagram of the MTU-ARPM	62
Figure 17 – State transition diagram of the MSU-ARPM	63
Figure 18 – State transition diagram of DMPM	67
Table 1 – Conventions used for AE state machine definitions	17
Table 2 – Encoding of FaArHeader field	28
Table 3 – Primitives exchanged between FAL user and VARM	36
Table 4 – Parameters used with primitives exchanged FAL user and VARM	36
Table 5 – VARM state table – Sender transitions	37
Table 6 – VARM state table – Receiver transitions	38
Table 7 – Functions used by the VARM	39
Table 8 – Primitives exchanged between FAL user and EVTM	39
Table 9 – Parameters used with primitives exchanged FAL user and EVTM	39
Table 10 – EVTM state table – Sender transitions	40
Table 11 – EVTM state table – Receiver transitions	40
Table 12 – Functions used by the EVTM	40
Table 13 – Primitives exchanged between FAL user and LDRM	41
Table 14 – Parameters used with primitives exchanged FAL user and LDRM	41
Table 15 – LDRM state table – Sender transitions	42
Table 16 – LDRM state table – Receiver transitions	43
Table 17 – Functions used by the LDRM	43
Table 18 – Primitives exchanged between FAL user and FNIM	44
Table 19 – Parameters used with primitives exchanged FAL user and FNIM	44
Table 20 – FNIM state table – Sender transitions	45
Table 21 – FNIM state table – Receiver transitions	45
Table 22 – Functions used by the FNIM	47
Table 23 – Primitives exchanged between FAL user and TIMM	47
Table 24 – Parameters used with primitives exchanged FAL user and TIMM	47
Table 25 – TIMM states	48

Table 26 – TIMM state table – Sender transitions	49
Table 27 – TIMM state table – Receiver transitions	50
Table 28 – Functions used by the TIMM	51
Table 29 – Primitives exchanged between FAL user and NWMM	51
Table 30 – Parameters used with primitives exchanged FAL user and NWMM.....	52
Table 31 – NWMM states	52
Table 32 – NWMM state table – Sender transitions.....	53
Table 33 – NWMM state table – Receiver transitions	54
Table 34 – Functions used by the NWMM.....	55
Table 35 – Primitives exchanged between FSPM and ARPM	56
Table 36 – Parameters used with primitives exchanged FSPM user and ARPM	56
Table 37 – PTC-ARPM states	56
Table 38 – PTC-ARPM state table – Sender transitions	57
Table 39 – PTC-ARPM state table – Receiver transitions.....	58
Table 40 – PTU-ARPM states	59
Table 41 – PTU-ARPM state table – Sender transitions	59
Table 42 – PTU-ARPM state table – Receiver transitions.....	60
Table 43 – PSU-ARPM states	60
Table 44 – PSU-ARPM state table – Sender transitions	61
Table 45 – PSU-ARPM state table – Receiver transitions	61
Table 46 – MTU-ARPM states	62
Table 47 – MTU-ARPM state table – Sender transitions.....	62
Table 48 – MTU-ARPM state table – Receiver transitions	63
Table 49 – MSU-ARPM states.....	63
Table 50 – MSU-ARPM state table – Sender transitions	64
Table 51 – MSU-ARPM state table – Receiver transitions	64
Table 52 – Functions used by the ARPMs	65
Table 53 – Primitives exchanged between DMPM and ARPM	66
Table 54 – Primitives exchanged between data-link layer and DMPM.....	66
Table 55 – DMPM states.....	67
Table 56 – DMPM state table – Sender transitions	67
Table 57 – DMPM state table – Receiver transitions	69
Table 58 – Functions used by the DMPM	69

INTRODUCTION

This part of IEC 61158 is one of a series produced to facilitate the interconnection of automation system components. It is related to other standards in the set as defined by the "three-layer" fieldbus reference model described in IEC/TR 61158-1.

The application protocol provides the application service by making use of the services available from the data-link or other immediately lower layer. The primary aim of this standard is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer application entities (AEs) at the time of communication. These rules for communication are intended to provide a sound basis for development in order to serve a variety of purposes:

- as a guide for implementors and designers;
- for use in the testing and procurement of equipment;
- as part of an agreement for the admittance of systems into the open systems environment;
- as a refinement to the understanding of time-critical communications within OSI.

This standard is concerned, in particular, with the communication and interworking of sensors, effectors and other automation devices. By using this standard together with other standards positioned within the OSI or fieldbus reference models, otherwise incompatible systems may work together in any combination.

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 6-17: Application layer protocol specification – Type 17 elements

1 Scope

1.1 General

The fieldbus application layer (FAL) provides user programs with a means to access the fieldbus communication environment. In this respect, the FAL can be viewed as a “window between corresponding application programs.”

This standard provides common elements for basic time-critical and non-time-critical messaging communications between application programs in an automation environment and material specific to Type 17 fieldbus. The term “time-critical” is used to represent the presence of a time-window, within which one or more specified actions are required to be completed with some defined level of certainty. Failure to complete specified actions within the time window risks failure of the applications requesting the actions, with attendant risk to equipment, plant and possibly human life.

This standard specifies interactions between remote applications and defines the externally visible behavior provided by the Type 17 fieldbus application layer in terms of

- a) the formal abstract syntax defining the application layer protocol data units conveyed between communicating application entities;
- b) the transfer syntax defining encoding rules that are applied to the application layer protocol data units;
- c) the application context state machine defining the application service behavior visible between communicating application entities;
- d) the application relationship state machines defining the communication behavior visible between communicating application entities.

The purpose of this standard is to define the protocol provided to

- 1) define the wire-representation of the service primitives defined in IEC 61158-5-17, and
- 2) define the externally visible behavior associated with their transfer.

This standard specifies the protocol of the Type 17 fieldbus application layer, in conformance with the OSI Basic Reference Model (ISO/IEC 7498) and the OSI application layer structure (ISO/IEC 9545).

1.2 Specifications

The principal objective of this standard is to specify the syntax and behavior of the application layer protocol that conveys the application layer services defined in IEC 61158-5-17.

A secondary objective is to provide migration paths from previously-existing industrial communications protocols. It is this latter objective which gives rise to the diversity of protocols standardized in the IEC 61158-6 series.

1.3 Conformance

This standard does not specify individual implementations or products, nor does it constrain the implementations of application layer entities within industrial automation systems. Conformance is achieved through implementation of this application layer protocol specification.

2 Normative reference

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 61158-5-17, *Industrial communication networks – Fieldbus specifications – Part 5-17: Application layer service definition – Type 17 elements*

ISO/IEC 7498 (all parts), *Information technology – Open Systems Interconnection – Basic Reference Model*

ISO/IEC 8824-2, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification*

ISO/IEC 8825-1, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 9545, *Information technology – Open Systems Interconnection – Application Layer structure*

ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic Reference Model – Conventions for the definition of OSI services*

3 Definitions

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

3.1 Terms and definitions

3.1.1 ISO/IEC 7498-1 terms

For the purposes of this document, the following terms as defined in ISO/IEC 7498-1 apply:

- a) application entity
- b) application protocol data unit
- c) application service element

3.1.2 ISO/IEC 8824-2 terms

For the purposes of this document, the following terms as defined in ISO/IEC 8824 apply:

- a) any type
- b) bitstring type
- c) Boolean type
- d) choice type
- e) false
- f) integer type
- g) null type
- h) octetstring type
- i) sequence of type
- j) sequence type
- k) simple type
- l) structured type

- m) tagged type
- n) true
- o) type
- p) value

3.1.3 ISO/IEC 10731 terms

- a) (N)-connection
- b) (N)-entity
- c) (N)-layer
- d) (N)-service
- e) (N)-service-access-point
- f) confirm (primitive)
- g) indication (primitive)
- h) request (primitive)
- i) response (primitive)

3.1.4 Other terms and definitions

3.1.4.1

application

function or data structure for which data is consumed or produced

3.1.4.2

application process

part of a distributed application on a network, which is located on one device and unambiguously addressed

3.1.4.3

application relationship

cooperative association between two or more application-entity-invocations for the purpose of exchange of information and coordination of their joint operation

NOTE This relationship is activated either by the exchange of application-protocol-data-units or as a result of preconfiguration activities

3.1.5

application relationship application service element

application-service-element that provides the exclusive means for establishing and terminating all application relationships

3.1.5.1

application relationship endpoint

context and behavior of an application relationship as seen and maintained by one of the application processes involved in the application relationship

NOTE Each application process involved in the application relationship maintains its own application relationship endpoint.

3.1.5.2

attribute

description of an externally visible characteristic or feature of an object

NOTE The attributes of an object contain information about variable portions of an object. Typically, they provide status information or govern the operation of an object. Attributes may also affect the behaviour of an object. Attributes are divided into class attributes and instance attributes.

3.1.5.3
behaviour

indication of how an object responds to particular events

3.1.5.4
bridge

intermediate equipment that connects two or more segments using a data-link layer relay function

3.1.5.5
channel

single physical or logical link of an input or output application object of a server to the process

3.1.5.6
class

a set of objects, all of which represent the same kind of system component

NOTE A class is a generalisation of an object; a template for defining variables and methods. All objects in a class are identical in form and behaviour, but usually contain different data in their attributes.

3.1.5.7
client

- a) object which uses the services of another (server) object to perform a task
- b) initiator of a message to which a server reacts

3.1.5.8
connection

logical binding between application objects that may be within the same or different devices

NOTE 1 Connections may be either point-to-point or multipoint.

NOTE 2 The logical link between sink and source of attributes and services at different custom interfaces of RT-Auto AEs is referred to as interconnection. There is a distinction between data and event interconnections. The logical link and the data flow between sink and source of automation data items is referred to as data interconnection. The logical link and the data flow between sink (method) and source (event) of operational services is referred to as event interconnection.

3.1.5.9
connection point

buffer which is represented as a subinstance of an Assembly object

3.1.5.10
conveyance path

unidirectional flow of APDUs across an application relationship

3.1.5.11
dedicated AR

AR used directly by the FAL User

NOTE On Dedicated ARs, only the FAL Header and the user data are transferred.

3.1.5.12
device

physical hardware connected to the link

NOTE A device may contain more than one node.

3.1.5.13
domain

part of the RTE network consisting of one or two subnetwork(s)

NOTE Two subnetworks are required to compose a dual-redundant RTE network, and each end node in the domain is connected to both of the subnetworks.

3.1.5.14

domain master

station which performs diagnosis of routes to all other domains, distribution of network time to nodes inside the domain, acquisition of absolute time from the network time master and notification of status of the domain

3.1.5.15

domain number

numeric identifier which indicates a domain

3.1.5.16

end node

producing or consuming node

3.1.5.17

endpoint

one of the communicating entities involved in a connection

3.1.5.18

error

discrepancy between a computed, observed or measured value or condition and the specified or theoretically correct value or condition

3.1.5.19

error class

general grouping for related error definitions and corresponding error codes

3.1.5.20

external bridge

bridge to which neither internal bridges nor RTE stations are connected directly

3.1.5.21

event

an instance of a change of conditions

3.1.5.22

group

- a) <general> a general term for a collection of objects. Specific uses:
- b) <addressing> when describing an address, an address that identifies more than one entity

3.1.5.23

interface

- a) shared boundary between two functional units, defined by functional characteristics, signal characteristics, or other characteristics as appropriate
- b) collection of FAL class attributes and services that represents a specific view on the FAL class

3.1.5.24

interface port

physical connection point of an end node, which has an independent DL-address

3.1.5.25

internal bridge

bridge to which no routers, external bridges or nodes non-compliant with this specification are connected directly

3.1.5.26

invocation

act of using a service or other resource of an application process

NOTE Each invocation represents a separate thread of control that may be described by its context. Once the service completes, or use of the resource is released, the invocation ceases to exist. For service invocations, a service that has been initiated but not yet completed is referred to as an outstanding service invocation. Also for service invocations, an Invoke ID may be used to unambiguously identify the service invocation and differentiate it from other outstanding service invocations.

3.1.5.27

junction bridge

bridge to which at least one router, external bridge or node non-compliant with this specification, and to which at least one internal bridge or RTE station is connected

3.1.5.28

link

physical communication channel between two nodes

3.1.5.29

method

<object> a synonym for an operational service which is provided by the server ASE and invoked by a client

3.1.5.30

network

a set of nodes connected by some type of communication medium, including any intervening repeaters, bridges, routers and lower-layer gateways

3.1.5.31

network time master

station which distributes network time to domain masters

3.1.5.32

node

single DL-entity as it appears on one local link

3.1.5.33

non-redundant interface node

node which has a single interface port

3.1.5.34

non-redundant station

station that consists of a single end node

NOTE "non-redundant station" is synonymous with "end node".

3.1.5.35

object

abstract representation of a particular component within a device, usually a collection of related data (in the form of variables) and methods (procedures) for operating on that data that have clearly defined interface and behaviour

3.1.5.36

originator

client responsible for establishing a connection path to the target

3.1.5.37

path

logical communication channel between two nodes, which consists of one or two link(s)

3.1.5.38

peer

role of an AR endpoint in which it is capable of acting as both client and server

3.1.5.39

producer

node that is responsible for sending data

3.1.5.40

provider

source of a data connection

3.1.5.41

publisher

role of an AR endpoint that transmits APDUs onto the fieldbus for consumption by one or more subscribers

NOTE A publisher may not be aware of the identity or the number of subscribers and it may publish its APDUs using a dedicated AR.

3.1.5.42

redundant interface node

node with two interface ports one of which is connected to a primary network, while the other is connected to a secondary network

3.1.5.43

redundant station

station that consists of a pair of end nodes

NOTE Each end node of a redundant station has the same station number, but has a different DL-address.

3.1.5.44

resource

a processing or information capability of a subsystem

3.1.5.45

RTE station

station compliant with this specification

3.1.5.46

route

logical communication channel between two communication end nodes

3.1.5.47

router

intermediate equipment that connects two or more subnetworks using a network layer relay function

3.1.5.48

segment

communication channel that connects two nodes directly without intervening bridges

3.1.5.49

server

- a) role of an AREP in which it returns a confirmed service response APDU to the client that initiated the request
- b) object which provides services to another (client) object

3.1.5.50

service

operation or function than an object and/or object class performs upon request from another object and/or object class

3.1.5.51

station

end node or a pair of end nodes that perform a specific application function

3.1.5.52

station number

numeric identifier which indicates a RTE station

3.1.5.53

subnetwork

part of a network that does not contain any routers. A subnetwork consists of end nodes, bridges and segments

NOTE Every end node included in a subnetwork has the same IP network address.

3.1.5.54

subscriber

role of an AREP in which it receives APDUs produced by a publisher

3.2 Abbreviations and symbols

3.2.1 ISO/IEC 10731 abbreviations

ASE	application-service-element
OSI	Open Systems Interconnection

3.2.2 ISO/IEC 7498-1 abbreviations and symbols

DL-	Data-link layer (as a prefix)
DLL	DL-layer
DLM	DL-management
DLS	DL-service
DLSAP	DL-service-access-point
DLSDU	DL-service-data-unit

3.2.3 IEC 61158-5-17 abbreviations and symbols

AE	application entity
AL	application layer
AP	application process
APDU	application protocol data unit
AR	application relationship
AREP	application relationship endpoint
ASN.1	abstract syntax notation one
BCD	binary coded decimal
Cnf	confirmation
cnf	confirmation primitive
Ev_	prefix for data types defined for event ASE
FAL	fieldbus application layer

Gn_	prefix for data types defined for general use
ID	identifier
IEC	International Electrotechnical Commission
Ind	indication
ind	indication primitive
IP	Internet protocol
ISO	International Organization for Standardization
lsb	least significant bit
msb	most significant bit
PDU	protocol data unit
Req	request
req	request primitive
Rsp	response
rsp	response primitive
SAP	service access point
SDU	service data unit

3.2.4 Other abbreviations and symbols

ARPM	application relationship protocol machine
FSPM	FAL service protocol machine
MSU-AR	multipoint network-scheduled unconfirmed publisher/subscriber AREP
MTU-AR	multipoint user-triggered unconfirmed publisher/subscriber AREP
PSU-AR	point-to-point network-scheduled unconfirmed client/server AREP
PTC-AR	point-to-point user-triggered confirmed client/server AREP
PTU-AR	point-to-point user-triggered unconfirmed client/server AREP

3.3 Conventions

3.3.1 General conventions

This standard uses the descriptive conventions given in ISO/IEC 10731.

This standard uses the descriptive conventions given in IEC 61158-5 subseries for FAL service definitions.

3.3.2 Conventions for APDU abstract syntax definitions

This standard uses the descriptive conventions given in ISO/IEC 8824-2 for APDU definitions.

3.3.3 Conventions for APDU transfer syntax definitions

This standard uses the descriptive conventions given in ISO/IEC 8825-1 for transfer syntax definitions.

3.3.4 Conventions for AE state machine definitions

The conventions used for AE state machine definitions are described in Table 1.

Table 1 – Conventions used for AE state machine definitions

No.	Current state	Event / condition => action	Next state
Name of this transition	The current state to which this state transition applies	Events or conditions that trigger this state transition. => The actions that are taken when the above events or conditions are met. The actions are always indented below events or conditions	The next state after the actions in this transition are taken

The conventions used in the descriptions for the events, conditions and actions are as follows:

:= The value of an item on the left is replaced by the value of an item on the right. If an item on the right is a parameter, it comes from the primitive shown as an input event.

xxx Parameter name.

Example:

Identifier := reason

means value of the 'reason' parameter is assigned to the parameter called 'Identifier.'

“xxx” Indicates fixed value.

Example:

Identifier := “abc”

means value “abc” is assigned to a parameter named 'Identifier.'

= A logical condition to indicate an item on the left is equal to an item on the right.

< A logical condition to indicate an item on the left is less than the item on the right.

> A logical condition to indicate an item on the left is greater than the item on the right.

<> A logical condition to indicate an item on the left is not equal to an item on the right.

&& Logical “AND”

|| Logical “OR”

The sequence of actions and the alternative actions can be executed using the following reserved words.

for

endfor

if

else

elseif

The following shows examples of description using the reserved words.

Example 1:

```
for (Identifier := start_value to end_value)
    actions
```

```
endfor
```

Example 2:

```
If (condition)
    actions
```

```
else
    actions
```

```
endif
```

4 Abstract syntax description

4.1 FAL PDU abstract syntax

4.1.1 Top level definition

```
FalArPDU ::=
    ConfirmedSend-CommandPDU
  || ConfirmedSend-ResponsePDU
  || UnconfirmedSend-CommandPDU
```

4.1.2 FalArHeader

```
FalArHeader ::= Unsigned8{
    -- bit 8-7      ProtocolVersion
    -- bit 6-4      ProtocolIdentifier
    -- bit 3-1      PDUIdentifier
}
```

4.1.3 Confirmed send service

```
ConfirmedSend-CommandPDU ::= SEQUENCE {
    FalArHeader,
    ServiceType
    InvokeID,
    ConfirmedServiceRequest
}
```

```
ConfirmedSend-ResponsePDU ::= SEQUENCE {
    FalArHeader,
    ServiceType
    InvokeID,
    ConfirmedServiceResponse
}
```

4.1.4 Unconfirmed send service

```
UnconfirmedSend-CommandPDU ::= SEQUENCE {
    FalArHeader,
    ServiceType
    InvokeID,
    UnconfirmedServiceRequest
}
```

4.2 Abstract syntax of PDU body

4.2.1 ConfirmedServiceRequest PDUs

```
ConfirmedServiceRequest ::= CHOICE {
    Read-Request          [0]    IMPLICIT    Read-RequestPDU,
    Write-Request         [1]    IMPLICIT    Write-RequestPDU,
    DownLoad-Request      [2]    IMPLICIT    DownLoad-RequestPDU,
    UpLoad-Request        [3]    IMPLICIT    UpLoad-RequestPDU,
    Start-Request         [4]    IMPLICIT    Start-RequestPDU,
    Stop-Request          [5]    IMPLICIT    Stop-RequestPDU,
    Resume- Request       [6]    IMPLICIT    Resume-RequestPDU,
    DelayCheck-Request    [7]    IMPLICIT    Time- RequestPDU,
}
```

4.2.2 ConfirmedServiceResponse PDUs

```
ConfirmedServiceResponse ::= CHOICE {
    Read-Response           [0]    IMPLICIT    Read-ResponsePDU,
    Write-Response          [1]    IMPLICIT    Write-ResponsePDU,
    DownLoad-Response       [2]    IMPLICIT    DownLoad-ResponsePDU,
    UpLoad-Response         [3]    IMPLICIT    UpLoad-ResponsePDU,
    Start-Response          [4]    IMPLICIT    Start-ResponsePDU,
    Stop-Response           [5]    IMPLICIT    Stop-ResponsePDU,
    Resume-Response         [6]    IMPLICIT    Resume-ResponsePDU,
    DelayCheck-Response     [7]    IMPLICIT    Time-ResponsePDU
}
```

4.2.3 Unconfirmed PDUs

```
UnconfirmedServiceRequest ::= CHOICE {
    InformationReport-Request [0]    IMPLICIT    InformationReport-RequestPDU,
    EventNotification-Request [1]    IMPLICIT    EventNotification-RequestPDU,
    EventRecovery-Request    [2]    IMPLICIT    EventRecovery-RequestPDU,
    TimeDistribution-Request  [3]    IMPLICIT    TimeDistribute-RequestPDU,
    SetTime-Request          [4]    IMPLICIT    SetTime-RequestPDU,
    InDiag-Request           [5]    IMPLICIT    InDiag-RequestPDU,
    ExDiag-Request           [6]    IMPLICIT    ExDiag-RequestPDU,
    StationStatusReport-Request [7]    IMPLICIT    StationStatusReport-RequestPDU,
    DomainStatusReport-Request [8]    IMPLICIT    DomainStatusReport-RequestPDU
}
```

4.2.4 Error information

4.2.4.1 Error type

```
ErrorType ::= SEQUENCE {
    errorClass           [0]    IMPLICIT    ErrorClass,
    additionalCode       [1]    IMPLICIT    Integer16 OPTIONAL,
    additionalDescription [2]    IMPLICIT    VisibleString OPTIONAL,
    additionalInfo       [3]    IMPLICIT    ANY OPTIONAL
}
```