

INTERNATIONAL STANDARD

**Industrial communication networks – Fieldbus specifications –
Part 4-11: Data-link layer protocol specification – Type 11 elements**

(<https://standards.iteh.ai>)

Document Preview

IEC 61158-4-11:2010

<https://standards.iteh.ai/catalog/standards/iec/02a34e12-6273-4dc9-9194-d0273aab7dc8/iec-61158-4-11-2010>

WITHDRAWN



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch

Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

IEC 111-4-11:2010

<https://standards.iec.org/standards/iec/02c34e12-6273-4dc9-9194-d0273aab7dc8/iec-61158-4-11-2010>



IEC 61158-4-11

Edition 2.0 2010-08

INTERNATIONAL STANDARD

Industrial communication networks – Fieldbus specifications –
Part 4-11: Data-link layer protocol specification – Type 11 elements

(<https://standards.iteh.ai>)
Document Preview

IEC 61158-4-11:2010

<https://standards.iteh.ai/en/standards/iec/02c34c12-6273-4dc9-9194-d0273aab7dc8/iec-61158-4-11-2010>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE

XF

ICS 25.04.40; 35.100.20; 35.110

ISBN 978-2-88912-086-4

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	10
1.1 General.....	10
1.2 Specifications.....	10
1.3 Procedures.....	10
1.4 Applicability.....	11
1.5 Conformance.....	11
2 Normative references.....	11
3 Terms, definitions, symbols and abbreviations.....	11
3.1 Reference model terms and definitions.....	11
3.2 Service convention terms and definitions.....	13
3.3 Terms and definitions.....	14
3.4 Symbols and abbreviations.....	18
4 Overview of the DL-protocol.....	19
4.1 General.....	19
4.2 Overview of the medium access control.....	19
4.3 Service assumed from the PhL.....	21
4.4 DLL architecture.....	21
4.5 Access control machine and schedule support functions.....	25
4.6 Local parameters, variables, counters, timers and queues.....	26
5 General structure and encoding of PHIDU and DLPDU and related elements of procedure.....	43
5.1 Overview.....	43
5.2 PHIDU structure and encoding.....	43
5.3 Common MAC frame structure, encoding and elements of procedure.....	44
5.4 Elements of the MAC frame.....	44
5.5 Order of bit transmission.....	49
5.6 Invalid DLPDU.....	49
6 DLPDU-specific structure, encoding and elements of procedure.....	49
6.1 General.....	49
6.2 Synchronization DLPDU (SYN).....	50
6.3 Transmission complete DLPDU (CMP).....	55
6.4 In-ring request DLPDU (REQ).....	56
6.5 Claim DLPDU (CLM).....	57
6.6 Command DLPDU (COM).....	58
6.7 Cyclic data and cyclic data with transmission complete DLPDU (DT) and (DT-CMP).....	59
6.8 RAS DLPDU (RAS).....	60
6.9 Loop repeat request DLPDU (LRR).....	61
6.10 Loop diagnosis DLPDU (LPD).....	65
7 DLE elements of procedure.....	66
7.1 DLE elements of procedure for star-architecture.....	66
7.2 DLE elements of procedure for loop-architecture.....	90
7.3 Serializer and deserializer.....	123
7.4 DLL management protocol.....	123

Bibliography.....	134
Figure 1 – Relationships of DLSAPs, DLSAP-addresses and group DL-addresses	15
Figure 2 – Basic principle of medium access control	20
Figure 3 – Interaction of PhS primitives to DLE	21
Figure 4 – Data-link layer internal architecture of star-architecture	23
Figure 5 – Data-link layer internal architecture of loop-architecture	25
Figure 6 – Common MAC frame format for DLPDUs.....	44
Figure 7 – Structure of FC field.....	45
Figure 8 – Structure of SYN DLPDU	50
Figure 9 – Structure of CMP DLPDU	55
Figure 10 – Structure of REQ DLPDU	56
Figure 11 – Structure of CLM DLPDU	57
Figure 12 – Structure of COM DLPDU.....	59
Figure 13 – Structure of DT DLPDU	59
Figure 14 – Structure of RAS DLPDU.....	60
Figure 15 – Structure of User data of loop-architecture	61
Figure 16 – Structure of LRR DLPDU	62
Figure 17 – Open-ring under control	64
Figure 18 – Structure of LPD DLPDU	65
Figure 19 – Overall structure of DLL	67
Figure 20 – DLE state transition.....	68
Figure 21 – State transition diagram of CTRC.....	70
Figure 22 – State transition diagram of STRC	73
Figure 23 – State transition diagram of ACM.....	77
Figure 24 – State transition diagram of RMC sending and send arbitration.....	85
Figure 25 – State transition diagram of RMC receiving.....	88
Figure 26 – Overall structure of DLL	91
Figure 27 – DLE state transition.....	92
Figure 28 – State transition diagram of CTRC	94
Figure 29 – State transition diagram of STRC	98
Figure 30 – State transition diagram of ACM.....	102
Figure 31 – State transition diagram of RMC.....	112
Figure 32 – State transition diagram of DLM	126
Figure 33 – State transition diagram of DLM	130
Table 1 – Data-link layer components of star-architecture.....	22
Table 2 – Data-link layer components of loop-architecture	24
Table 3 – DLE-variables and permissible values of star-architecture.....	27
Table 4 – Observable variables and their value ranges of star-architecture.....	29
Table 5 – DLE variables and permissible values of loop-architecture	30
Table 6 – Observable variables and their value ranges of loop-architecture	32
Table 7 – F-type: DLPDU type	46

Table 8 – FCS length, polynomials and constants	47
Table 9 – PN-parameter: 3rd octet	51
Table 10 – Structure of CW: 4th octet	51
Table 11 – PM parameter	51
Table 12 – RMSEL parameter	52
Table 13 – Structure of CW: 4th octet	52
Table 14 – ST-parameter: 5th octet.....	52
Table 15 – Th-parameter: 6th, 7th and 8th octets.....	53
Table 16 – Tm-parameter: 9th and 10th octets.....	53
Table 17 – Ts-parameter: 11th and 12th octets	53
Table 18 – TI-parameter: 13th and 14th octets	53
Table 19 – LL parameters: 15th to 46th octets	54
Table 20 – RN parameter.....	56
Table 21 – CLM parameter: 4th octet.....	57
Table 22 – DT parameter: 3rd and 4th octets	59
Table 23 – RAS parameter: 3rd and 4th octets.....	61
Table 24 – Format of the PS parameter: 3rd octet.....	62
Table 25 – The value of the PP parameter.....	62
Table 26 – The value of the send-enable-A/B	62
Table 27 – The value of the receive-enable-A/B.....	63
Table 28 – The value of the forward-enable-A/B	63
Table 29 – RN parameter: 4th octet	63
Table 30 – Operational condition of the node.....	64
Table 31 – Primitives exchanged between DLS-user and CTRC.....	69
Table 32 – Primitives exchanged between CTRC and ACM.....	69
Table 33 – Parameters used with primitives exchanged between DLS-user and CTRC	70
Table 34 – CTRC state table.....	71
Table 35 – CTRC functions table	72
Table 36 – Primitives exchanged between DLS-user and STRC.....	72
Table 37 – Primitives exchanged between STRC and ACM.....	73
Table 38 – Parameters used with primitives exchanged between DLS-user and STRC	73
Table 39 – STRC state table.....	74
Table 40 – STRC functions table	75
Table 41 – Primitives exchanged between ACM and RMC	76
Table 42 – Parameters used with primitives exchanged between ACM and RMC	76
Table 43 – Primitives exchanged between ACM and CTRC.....	76
Table 44 – Parameters used with primitives exchanged between ACM and CTRC	76
Table 45 – Primitives exchanged between ACM and STRC.....	77
Table 46 – Parameters used with primitives exchanged between ACM and STRC.....	77
Table 47 – ACM state table.....	78
Table 48 – ACM function table	83
Table 49 – Primitives exchanged between ACM and RMC	84
Table 50 – Primitives exchanged between RMC and serializer / deserializer.....	84

Table 51 – Primitives exchanged between RMC and Ph-layer	84
Table 52 – Parameters between RMC and ACM	84
Table 53 – Parameters between RMC and Ph-layer	85
Table 54 – State table of RMC sending	86
Table 55 – State table of RMC send arbitration	87
Table 56 – State table for RMC receiving	88
Table 57 – RMC function table	90
Table 58 – Primitives exchanged between DLS-user and CTRC	93
Table 59 – Primitives exchanged between CTRC and ACM	94
Table 60 – Parameters used with primitives exchanged between DLS-user and CTRC	94
Table 61 – CTRC state table	95
Table 62 – CTRC functions table	96
Table 63 – Primitives exchanged between DLS-user and STRC	97
Table 64 – Primitives exchanged between STRC and ACM	97
Table 65 – Parameters used with primitives exchanged between DLS-user and STRC	97
Table 66 – STRC state table	98
Table 67 – STRC functions table	99
Table 68 – Primitives exchanged between ACM and RMC	100
Table 69 – Parameters used with primitives exchanged between ACM and RMC	100
Table 70 – Primitives exchanged between ACM and CTRC	100
Table 71 – Parameters used with primitives exchanged between ACM and CTRC	100
Table 72 – Primitives exchanged between ACM and STRC	101
Table 73 – Parameters used with primitives exchanged between ACM and STRC	101
Table 74 – ACM state table	103
Table 75 – ACM function table	110
Table 76 – Primitives exchanged between ACM and RMC	111
Table 77 – Primitives exchanged between RMC and Serializer / Deserializer	111
Table 78 – Primitives exchanged between RMS and Ph-layer	111
Table 79 – Parameters between RMC and ACM	112
Table 80 – Parameters between RMC and Serializer / Deserializer, Ph-layer	112
Table 81 – State table of RMC	113
Table 82 – The RMC function table	122
Table 83 – Primitives exchanged between DLMS-user and DLM	123
Table 84 – Parameters used with primitives exchanged between DL-user and DLM	124
Table 85 – Event-related state change variables	125
Table 86 – DLM state table	126
Table 87 – DLM function table	128
Table 88 – Primitives exchanged between DLMS-user and DLM	129
Table 89 – Parameters used with primitives exchanged between DL-user and DLM	129
Table 90 – Event-related state change variables	130
Table 91 – DLM state table	131
Table 92 – DLM function table	133

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS –
FIELDBUS SPECIFICATIONS –****Part 4-11: Data-link layer protocol specification –
Type 11 elements**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

International Standard IEC 61158-4-11 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

- Introduction has been modified to add the patents related to the loop-architecture
- Addition of loop (ring) -architecture
- More details:
 - Subclause 4.4 is extended to cover the loop-architecture as 4.4.3.
 - Subclause 4.6; structure has changed in order to include the loop-architecture, and the data types of variables have been added:

- 4.6.1 Overview;
- 4.6.1.2 Summary of variables of existing star-architecture;
- 4.6.1.3 Summary of variables of additional loop-architecture;
- 4.6.2 Type 11 common variables, parameters, counters, timers and queues;
- 4.6.3 Star-architecture specific variables, parameters, counters, timers and queues;
- 4.6.4 Loop-architecture specific variables, parameters, counters, timers and queues.
- All variables, parameters, counters, timers and queues are rearranged in alphabetical order.
- Subclause 5.4 is modified to cover the loop-architecture.
- Clause 6 is modified to cover the loop-architecture.
- Explanations of symbols referenced in each figure are modified to appear in the form of Key out of each figure object.
- Clause 7 is changed in the structure for inclusion and extension of the loop-architecture as follows:
 - DLE elements of procedure for existing star-architecture are maintained in 7.1 after restructuring with no change to the existing specification;
 - DLE elements of procedure for loop-architecture are added in 7.2;
 - Serializer and deserializer is maintained in 7.3 after restructuring;
 - DLL management protocol is in 7.4 after restructuring, and
 - DLL management protocol for star-architecture is maintained in 7.4.1 without change,
 - DLL management protocol for loop-architecture is added in 7.4.2.

The text of this standard is based on the following documents:

FDIS	Report on voting
65C/605/FDIS	65C/619/RVD

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

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

A list of all the parts of the IEC 61158 series, published under the general title *Industrial communication networks – Fieldbus specifications*, can be found on the IEC web site.

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

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

NOTE The revision of this standard will be synchronized with the other parts of the IEC 61158 series.

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 data-link protocol provides the data-link service by making use of the services available from the physical 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 data-link entities (DLEs) 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:

- a) as a guide for implementors and designers;
- b) for use in the testing and procurement of equipment;
- c) as part of an agreement for the admittance of systems into the open systems environment;
- d) 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.

NOTE Use of some of the associated protocol types is restricted by their intellectual-property-right holders. In all cases, the commitment to limited release of intellectual-property-rights made by the holders of those rights permits a particular data-link layer protocol type to be used with physical layer and application layer protocols in Type combinations as specified explicitly in the profile parts. Use of the various protocol types in other combinations may require permission from their respective intellectual-property-right holders.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning Type 11 elements and possibly other types given in the subclause 4.2, 4.4, 4.5, 5.4, 6.2 to 6.10, 7.1 and 7.2 as follows:

- US 4,930,121 [TO] Network system using token-passing bus with multiple priority levels
- US 5,414,813 [TO] Direct transfer from a receive buffer to a host in a token-passing type network data transmission system
- US 6,711,131 [TO] Data transmitting apparatus, network interface apparatus, and data transmitting system
- PCT/JP2007/55292 [TO] Double ring network system, communication control method thereof, transmission station, and communication control program of double ring network system
- JP 3,461,954 [TO] Data transmission system

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holder of these patent rights has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of these patent rights is registered with IEC. Information may be obtained from:

[TO]Toshiba Corporation
 1-1, Shibaura 1-Chome
 Minato-ku Tokyo 105-8001, Japan
 Attention: Intellectual Property Rights Section.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://www.iec.ch/tctools/patent_decl.htm) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

Withdrawing

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

IEC 61158-4-11:2010
<https://standards.iteh.ai/catalog/standards/iec/02c34c12-6273-4dc9-9194-d0273aab7dc8/iec-61158-4-11-2010>

INDUSTRIAL COMMUNICATION NETWORKS – FIELDBUS SPECIFICATIONS –

Part 4-11: Data-link layer protocol specification – Type 11 elements

1 Scope

1.1 General

The data-link layer provides basic time-critical messaging communications between devices in an automation environment.

This protocol provides communication opportunities to all participating data-link entities

- a) in a synchronously-starting cyclic manner, according to a pre-established schedule, and
- b) in a cyclic or acyclic asynchronous manner, as requested each cycle by each of those data-link entities.

Thus this protocol can be characterized as one which provides cyclic and acyclic access asynchronously but with a synchronous restart of each cycle.

1.2 Specifications

This standard specifies

- a) procedures for the timely transfer of data and control information from one data-link user entity to a peer user entity, and among the data-link entities forming the distributed data-link service provider;
- b) procedures for giving communications opportunities to all participating DL-entities, sequentially and in a cyclic manner for deterministic and synchronized transfer at cyclic intervals up to one millisecond;
- c) procedures for giving communication opportunities available for time-critical data transmission together with non-time-critical data transmission without prejudice to the time-critical data transmission;
- d) procedures for giving cyclic and acyclic communication opportunities for time-critical data transmission with prioritized access;
- e) procedures for giving communication opportunities based on standard ISO/IEC 8802-3 medium access control, with provisions for nodes to be added or removed during normal operation;
- f) the structure of the fieldbus DLPDUs used for the transfer of data and control information by the protocol of this standard, and their representation as physical interface data units.

1.3 Procedures

The procedures are defined in terms of

- a) the interactions between peer DL-entities (DLEs) through the exchange of fieldbus DLPDUs;
- b) the interactions between a DL-service (DLS) provider and a DLS-user in the same system through the exchange of DLS primitives;
- c) the interactions between a DLS-provider and a Ph-service provider in the same system through the exchange of Ph-service primitives.

1.4 Applicability

These procedures are applicable to instances of communication between systems which support time-critical communications services within the data-link layer of the OSI or fieldbus reference models, and which require the ability to interconnect in an open systems interconnection environment.

Profiles provide a simple multi-attribute means of summarizing an implementation's capabilities, and thus its applicability to various time-critical communications needs.

1.5 Conformance

This standard also specifies conformance requirements for systems implementing these procedures. This standard does not contain tests to demonstrate compliance with such requirements.

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 61158-3-11:2007, *Industrial communication networks – Fieldbus specifications – Part 3-11: Data-link layer service definition – Type 11 elements*

IEC 61158-5-11:2007, *Industrial communication networks – Fieldbus specifications – Part 5-11: Application layer service definition – Type 11 elements*

IEC 61158-6-11:2007, *Industrial communication networks – Fieldbus specifications – Part 6-11: Application layer protocol specification – Type 11 elements*

ISO/IEC 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

ISO/IEC 7498-3, *Information technology – Open Systems Interconnection – Basic Reference Model: Naming and addressing*

ISO/IEC 8802-3:2000, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and Physical Layer specifications*

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

3 Terms, definitions, symbols and abbreviations

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

3.1 Reference model terms and definitions

This standard is based in part on the concepts developed in ISO/IEC 7498-1 and ISO/IEC 7498-3, and makes use of the following terms defined therein.

3.1.1	called-DL-address	[ISO/IEC 7498-3]
3.1.2	calling-DL-address	[ISO/IEC 7498-3]
3.1.3	centralized multi-end-point-connection	[ISO/IEC 7498-1]
3.1.4	correspondent (N)-entities	[ISO/IEC 7498-1]
	correspondent DL-entities (N=2)	
	correspondent Ph-entities (N=1)	
3.1.5	demultiplexing	[ISO/IEC 7498-1]
3.1.6	DL-address	[ISO/IEC 7498-3]
3.1.7	DL-address-mapping	[ISO/IEC 7498-1]
3.1.8	DL-connection	[ISO/IEC 7498-1]
3.1.9	DL-connection-end-point	[ISO/IEC 7498-1]
3.1.10	DL-connection-end-point-identifier	[ISO/IEC 7498-1]
3.1.11	DL-connection-mode transmission	[ISO/IEC 7498-1]
3.1.12	DL-connectionless-mode transmission	[ISO/IEC 7498-1]
3.1.13	DL-data-sink	[ISO/IEC 7498-1]
3.1.14	DL-data-source	[ISO/IEC 7498-1]
3.1.15	DL-duplex-transmission	[ISO/IEC 7498-1]
3.1.16	DL-facility	[ISO/IEC 7498-1]
3.1.17	DL-local-view	[ISO/IEC 7498-3]
3.1.18	DL-name	[ISO/IEC 7498-3]
3.1.19	DL-protocol	[ISO/IEC 7498-1]
3.1.20	DL-protocol-connection-identifier	[ISO/IEC 7498-1]
3.1.21	DL-protocol-control-information	[ISO/IEC 7498-1]
3.1.22	DL-protocol-data-unit	[ISO/IEC 7498-1]
3.1.23	DL-protocol-version-identifier	[ISO/IEC 7498-1]
3.1.24	DL-relay	[ISO/IEC 7498-1]
3.1.25	DL-service-connection-identifier	[ISO/IEC 7498-1]
3.1.26	DL-service-data-unit	[ISO/IEC 7498-1]
3.1.27	DL-simplex-transmission	[ISO/IEC 7498-1]
3.1.28	DL-subsystem	[ISO/IEC 7498-1]
3.1.29	DL-user-data	[ISO/IEC 7498-1]
3.1.30	flow control	[ISO/IEC 7498-1]
3.1.31	layer-management	[ISO/IEC 7498-1]
3.1.32	multiplexing	[ISO/IEC 7498-3]

iTech Standards
<https://standards.iteh.ai/>
 Document Preview

IEC 61158-4-11:2010

<https://standards.iteh.ai/standards/iec/02334e12-6273-4dc9-9194-d0273aab> IEC 61158-4-11:2010