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Field device tool (FDT) interface specification

Part 52-32: Communication implementation for common language infrastructure - IEC 61784 CP 3/4, CP 3/5 and CP 3/6

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee GEL/65/3, Industrial communications: process measurement and control, including fieldbus.

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European foreword

This document (CLC IEC/TR 62453-52-32:2019) consists of the text of IEC/TR 62453-52-32:2017 prepared by SC 65E "Devices and integration in enterprise systems" of IEC/TC 65 "Industrial-process measurement, control and automation.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61131-3	2013	Programmable controllers - Part 3: Programming languages	EN 61131-3	2013
IEC 61158-6-10	-	Industrial communication networks - Fieldbus specifications - Part 6-10: Application layer protocol specification - Type 10 elements	EN 61158-6-10	-
IEC 61158	series	Industrial communication networks - Fieldbus specifications - Part 1: Overview and guidance for the IEC 61158 and IEC 61784 series	EN 61158	series
IEC 61784-1	2014	Industrial communication networks - Profiles - Part 1: Fieldbus profiles	EN 61784-1	2014
IEC 62453-1	2016	Field device tool (FDT) interface specification - Part 1: Overview and guidance	EN 62453-1	2017
IEC 62453-2	2016	Field device tool (FDT) interface specification - Part 2: Concepts and detailed description	EN 62453-2	2017
IEC TR 62453-42	2016	Field device tool (FDT) interface specification - Part 42: Object model integration profile - Common language infrastructure	-	-
IEC 62453-303-2	2009	Field device tool (FDT) interface specification - Part 303-2: Communication profile integration - IEC 61784 CP 3/4, CP 3/5 and CP 3/6	EN 62453-303-2	2009

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 52-32: Communication implementation for common language infrastructure – IEC 61784 CP 3/4, CP 3/5 and CP 3/6

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IEC TR 62453-52-32, which is a technical report, has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

Each part of the IEC 62453-52-xy series is intended to be read in conjunction with its corresponding part in the IEC 62453-3xy series. This document corresponds to IEC 62453-303-2.

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

Enquiry draft	Report on voting
65E/440/DTR	65E/514/RVC

Full information on the voting for the approval of this technical report 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.

The list of all parts of the IEC 62453 series, under the general title *Field device tool (FDT) interface specification*, can be found on the IEC website.

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

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

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

This part of IEC 62453 is an interface specification for developers of Field Device Tool (FDT) components for function control and data access within a client/server architecture. The specification is a result of an analysis and design process to develop standard interfaces to facilitate the development of servers and clients by multiple vendors that need to interoperate seamlessly.

With the integration of fieldbuses into control systems, there are a few other tasks which need to be performed. In addition to fieldbus- and device-specific tools, there is a need to integrate these tools into higher-level system-wide planning or engineering tools. In particular, for use in extensive and heterogeneous control systems, typically in the area of the process industry, the unambiguous definition of engineering interfaces that are easy to use for all those involved is of great importance.

A device-specific software component, called Device Type Manager (DTM), is supplied by the field device manufacturer with its device. The DTM is integrated into engineering tools via the FDT interfaces defined in this specification. The approach to integration is in general open for all kind of fieldbusses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how this part of the IEC 62453-52-xy series is aligned in the structure of the IEC 62453 series.

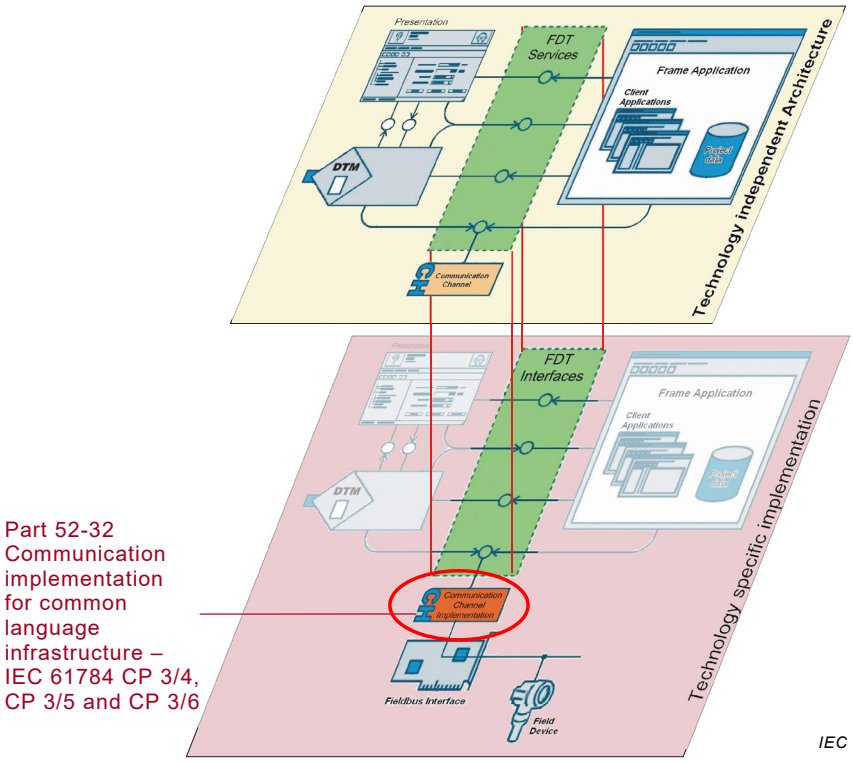

Figure 1 – Part 52-32 of the IEC 62453 series

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FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 52-32: Communication implementation for common language infrastructure – IEC 61784 CP 3/4, CP 3/5 and CP 3/6

1 Scope

This part of the IEC 62453-52-xy series, which is a Technical Report, provides information for integrating the PROFINET®[1] technology into the CLI-based implementation of FDT interface specification (IEC TR 62453-42).

This part of IEC 62453 specifies implementation of communication and other services based on IEC 62453-303-2.

This document neither contains the FDT specification nor modifies it.

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 61131-3:2013, *Programmable controllers – Part 3: Programming languages*

IEC 61158-6-10, *Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements*

IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61784-1:2014, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

IEC 62453-1:2016, *Field device tool (FDT) interface specification – Part 1: Overview and guidance*

IEC 62453-2:2016, *Field device tool (FDT) interface specification – Part 2: Concepts and detailed description*

IEC TR 62453-42: 2016, *Field device tool (FDT) interface specification – Part 42: Object model integration profile – Common language infrastructure*

IEC 62453-303-2:2009, *Field device tool (FDT) interface specification – Part 303-2: Communication profile integration – IEC 61784 CP 3/4, CP 3/5 and CP 3/6* IEC 62453-303-2:2009/AMD1:2016

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[1] PROFINET ® is the trademark of PROFIBUS Nutzerorganisation e.V. (PNO). PNO is a non-profit trade organization to support the fieldbus PROFIBUS. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the registered trademark. Use of the trademark PROFIBUS and PROFINET requires permission of the trade name holder.

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3 Terms, definitions, symbols, abbreviated terms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62453-1, IEC 62453-2, IEC TR 62453-42 and IEC 62453-303-2 apply.

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

3.2 Abbreviations

For the purposes of this document, the abbreviations given in IEC 62453-1, IEC 62453-2, IEC 62453-303-2, IEC TR 62453-42, and the following apply.

I&M	Identification and maintenance functions

3.3 Conventions

3.3.1 Datatype names and references to datatypes

The conventions for naming and referencing of datatypes are explained in FDT 2.0 Specification.

3.3.2 Vocabulary for requirements

The following expressions are used when specifying requirements.

Usage of “shall” or “mandatory”	No exceptions allowed.
Usage of “should” or “recommended”	Strong recommendation. It may make sense in special exceptional cases to differ from the described behaviour.
Usage of “can” or “optional”	Function or behaviour may be provided, depending on defined conditions.

3.3.3 Use of UML

Figures in this document are using UML notation as defined in Annex A of IEC 62453-1:2016.

4 Bus Category

PROFINET protocols are identified by the unique identifiers in busCategory attributes as specified in IEC 62453-303-2.

5 Access to instance and device data

5.1 General

Used at interfaces:

– IInstanceData
– IDeviceData

The minimum set of provided data shall be:

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- Process values shall be modeled as ProcessData including ranges and scaling, where applicable.
- All network configuration related parameters shall be exposed in NetworkData (see Clause 9).
- All startup parameters of sub modules shall be exposed in NetworkData (see Clause 9).
- It is recommended to expose startup parameters in the IDeviceData and IInstanceData interfaces; exposure of additional parameters is at the device vendor's discretion. Profiles may define a mandatory set of parameters.

5.2 IO signals provided by DTM

A DTM shall provide IO signal information for the device using the IProcessData interface. The IO signals describe datatype and address parameters of process data as detailed in Clause 11.

5.3 Data interfaces

5.3.1 General

Exposure of device parameters is at the vendor's discretion. Profiles may define the mandatory exposure of profile specific parameters. It is recommended to expose at least all startup parameters.

5.3.2 Mapping PROFINET datatypes to FDT datatypes

PROFINET uses datatypes as specified in IEC 61158 for the transmission on the fieldbus. The FDT interfaces IDeviceData and IInstanceData use .NET datatypes, while PLC applications use datatypes as defined in IEC 61131-3. This subclause defines the mapping of parameter datatypes, whereas mapping of process datatypes is defined in Clause 11. The mapping of parameter datatypes is described in Table 1.

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Table 1 – Mapping of datatypes

PROFINET datatype	FDT datatype	IEC datatype
Bit	boolean	BOOL
Integer8	int	SINT
Integer16	int	INT
Integer32	int	DINT
Integer64	int	LINT
Unsigned8	byte	USINT
Unsigned16	unsigned	UINT
Unsigned32	unsigned	UDINT
Unsigned64	unsigned	ULINT
Float32	float	REAL
Float64	double	LREAL
Date	date	LWORD
TimeOfDay	dateAndTime	LWORD
TimeOfDayWithoutDateIndication	time	TIME_OF_DAY
TimeDifference	structured	LWORD
TimeOfDayWithoutDateIndication	duration	DWORD
NetworkTime	structured	LWORD
NetworkTimeDifference	structured	LWORD
VisibleString	string	STRING
OctetString	hexString	STRING
Unsigned8Unsigned8	-	WORD
Float32Unsigned8	-	LWORD
Float32Status8	structured	LWORD
F_MessageTrailer4Byte	structured	DWORD
F_MessageTrailer5Byte	structured	LWORD
additional GSDML datatypes		
Bit	boolean	BOOL
BitArea	BinaryBitArray	ARRAY OF BYTE

5.3.3 SemanticInfo

The SemanticInfo provides means to uniquely identify parameters. The usage of SemanticInfo attributes is defined in Table 2.

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Table 2 – Usage of SemanticInfo

Attribute	Description of use for PROFINET
SemanticInfo.ReadAddress SemanticInfo.WriteAddress	The value of ReadAddress and WriteAdress is a string conforming to a pattern as follows: Api.Slot.Subslot.Index.ByteOffset.BitOffset.BitLength where Api = API number Slot = Slot number Subslot = Subslot number Index = Index number ByteOffset = start byte within the index BitOffset = start bit within the index BitLength = length in bits All values are unsigned integers. NOTE Profiles may define additional address formats.
SemanticInfo.ApplicationDomain	The value of ApplicationDomain is as follows: FDT PROFINET FDT PROFIDRIVE NOTE Profiles may define additional ApplicationDomain values.
SemanticInfo.SemanticId	The value of SemanticId is vendor specific. Profiles may define a distinct set of mandatory SemanticId values.

6 Protocol specific behavior

6.1 PROFINET device model

The PROFINET device model is captured in a hierarchical structure of ProtocolNetworkData class (see Figure 2). Further details on attributes and methods are provided in Clause 9.

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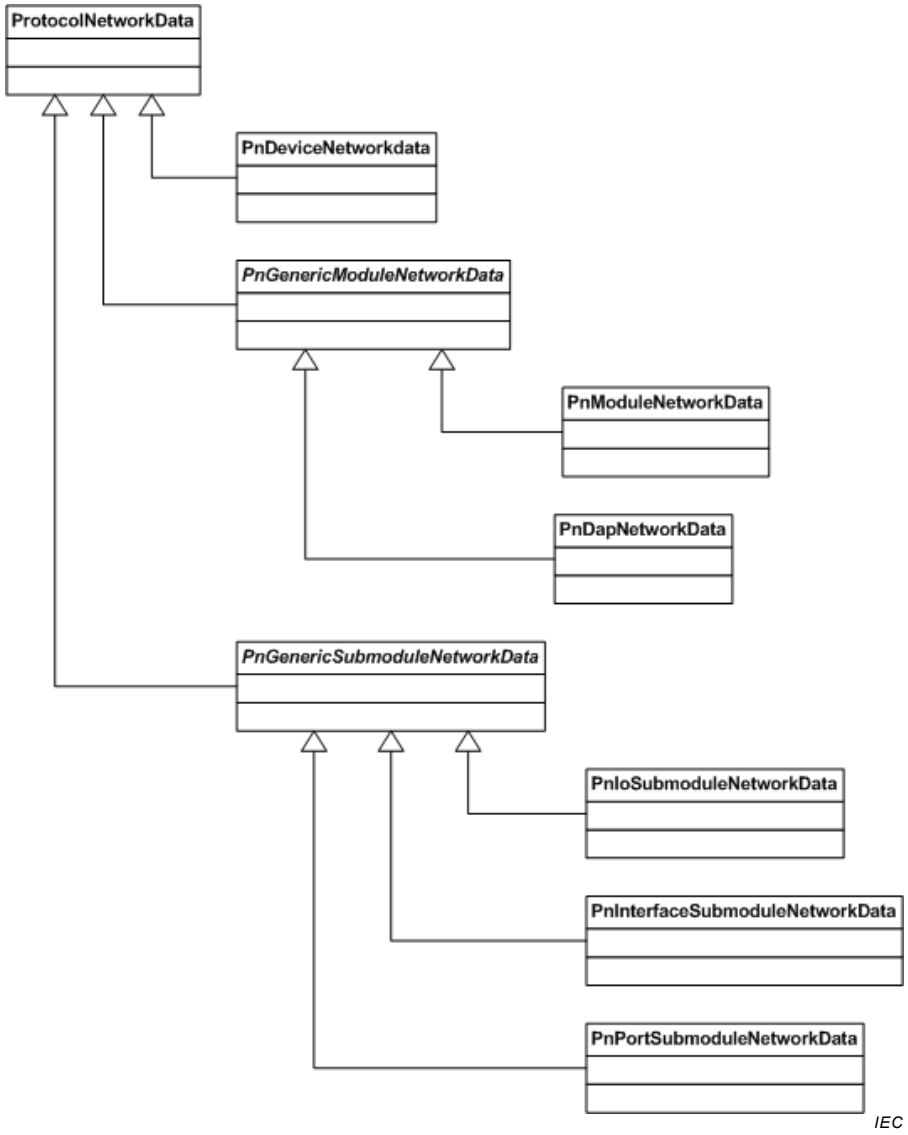

Figure 2 – PROFINET Device Model

6.2 Configuration and parameterization of PROFINET devices

In order to enable a PROFINET Communication DTM to configure and parameterize a PROFINET Network, all type data usually included in a vendor specific GSDML file, are provided in NetworkData (see Clause 9 for further details). The Communication DTM is responsible for calculating or querying any instance data needed for network configuration.

6.3 PROFINET – related information of a Device DTM

The information used by a PROFINET controller to set up the PROFINET network properly and allow cyclic communication between control system and PROFINET devices is provided by a DTM in:

- PROFINET network data
- Process data items.

A DTM of a PROFINET device shall deliver these parts of PROFINET related information to get integrated into an FDT-based engineering system. Below (see Clauses 8, 9 and 11), a more detailed description is given on how to generate and how to provide this information.

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