IEC TR 62453-51-31

Edition 1.0 2017-06

TECHNICAL REPORT

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Field device tool (FDT) interface specification – Part 51-31: Communication implementation for common object model – IEC 61784 CP 3/1 and CP 3/2

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Part 51-31: Communication implementation for common object model – IEC 61784 CP 3/1 and CP 3/2

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IEC TR 62453-51-31, which is a echnical report, has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process management, control and automation.

This document cancels and replaces IEC TR 62453-503-1 published in 2009. This edition constitutes a technical revision. The main changes consist of updates in accordance with IEC 62453-2 in regard to the description of “Composite Device DTM”.

Each part of the IEC 62453-51-xy series is intended to be read in conjunction with its corresponding part in the IEC 62453-3xy series. This document corresponds to IEC 62453-303-1.

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- withdrawn,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.

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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 fieldbuses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how this part of IEC 62453-51-xy series is aligned in the structure of the IEC 62453 series.

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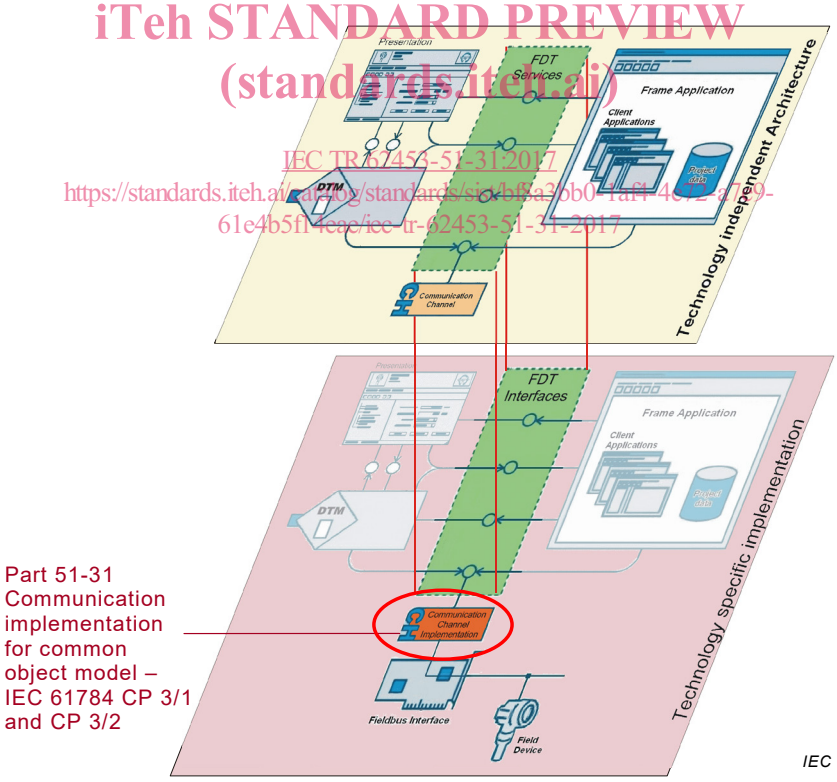

Figure 1 – Part 51-31 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 51-31: Communication implementation for common object model – IEC 61784 CP 3/1 and CP 3/2

1 Scope

This part of the IEC 62435-51-xy series, which is a Technical Report, provides information for integrating the PROFIBUS[1] protocol into the COM-based implementation of FDT interface specification (IEC TR 62453-41).

This part of IEC 62453 specifies implementation of communication and other services based on IEC 62453-303-1.

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.

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

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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 62453-41:2016, *Field device tool (FDT) interface specification – Part 41: Object model integration profile – Common object model*

IEC 62453-303-1:2009, *Field device tool (FDT) interface specification – Part 303-1: Communication profile integration – IEC 61784 CP 3/1 and CP 3/2*
IEC 62453-303-1:2009/AMD1:2016

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 62453-41 and IEC 62453-303-1 apply.

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

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3.2 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviations given in IEC 62453-1, IEC 62453-2, IEC 62453-303-1, and IEC TR 62453-41 apply.

3.3 Conventions

3.3.1 Data type names and references to data types

The conventions for naming and referencing of data types are explained in IEC 62453-2:2016, Clause A.1.

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.

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4 Bus category

IEC 61784 CP 3/1 and CP3/2 protocols are identified in the attribute busCategory of BusCategory element by the identifiers, as specified in IEC 62453-303-1.

IEC 61784 CPF 3 protocols are using the identifiers in physicalLayer members within PhysicalLayer data type as specified in IEC 62453-303-1.

5 Access to instance and device data

Used at methods:

- IDtmParameter methods
- IDtmSingleDeviceDataAccess methods
- IDtmSingleInstanceDataAccess methods

These methods (if supported according to IEC TR 62453-41) shall provide access to at least all parameters defined in IEC 62453-303-1.

6 Protocol specific behaviour

6.1 General

A DTM shall deliver its GSD information via method IDtmInformation::GetInformation() and IDtmParameter::GetParameters(). GSD information is provided in the attribute

<deviceTypeInformation>. Also, it is required to provide a GSD file for each supported device type on the hard drive. The attribute <deviceTypeInformationPath> in the DTMParameter document specifies the location of the GSD file.

It is expected that a Profibus DTM in the attribute 'deviceTypeInformation' is exposing exactly the GSD file which is referenced by the attribute 'deviceTypeInformationPath'.

If the GSD depends on bus settings, a DTM's configuration or parameterization dialog could be used to change bus settings. Based on these settings, updated GSD information can be inserted in the information document. Here too the DTM shall call IFdtContainer::SaveRequest() and IDtmEvents::OnParameterChanged().

Notice that the internal device structure (<InternalTopology>) with its modules and channels shall be updated as well.

An example for documents of a DTM representing a remote I/O can be found in Annex A.

6.2 Representing modularity

6.2.1 Monolithic DTMs

Monolithic DTM's should always provide at least one <Module> element.

A monolithic DTM that represents a modular device shall provide the structure information as part of the <InternalTopology> element. An <InternalChannel> element shall be defined for each <Module> element. The IO values of the device are represented by Process Channels, which are referenced by child elements of the <Module> elements. If any of the modules provides communication, the respective <Module> element shall reference a Communication Channel.

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EXAMPLE 1:
A monolithic DTM for a PROFIBUS PA device will provide the information about instantiated modules in the <InternalTopology> element. – Each instantiated module will be represented as a <Module> element.
The IO values of the modules are represented as Process Channels, which are referenced by child elements of the <Module> elements (see Figure 2).

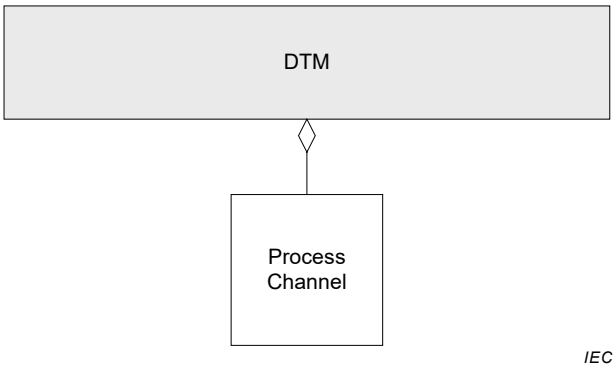

Figure 2 – Device DTM

The DTM shall provide an internal topology in the parameter document to inform the frame about the internal structure of the device. The internal topology shall also include the module structure (element <Module>).

The DTM shall provide all channels in the channel collection based on the current configuration.

When the DTM changes the configuration of the process data or the module configuration, the Process Channels shall be updated. This means Process Channels shall be removed/added

and the parameter document shall be updated (e.g. by adding/removing <Module> elements) if necessary.

Each channel is represented by a channel reference that is child of a <Module> element in the parameter document.

Each channel object delivers a document based on the FDTProfibusChannelParameterSchema in IFdtChannel::GetChannelParameters() for the supported protocol.

EXAMPLE 2:
A monolithic Gateway DTM for a remote I/O system, which requires PROFIBUS communication and has some modules, which provide HART communication will provide Communication Channels for HART modules that are also Process Channels and “pure” Process Channels for non-HART modules (see Figure 3).

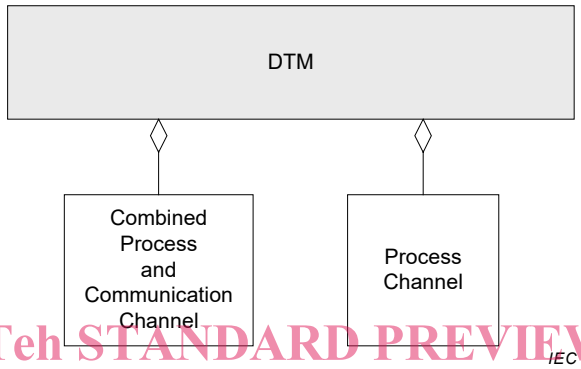

Figure 3 – Gateway DTM

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The DTM shall provide all channels in the channel collection based on the current configuration.

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When the DTM changes the configuration of the process data or the module configuration, the Process Channels shall be updated. This means Process Channels shall be removed/added and the parameter document shall be updated if necessary.

Communication Channel objects shall implement the interface IFdtCommunication.

Each channel is represented by a channel reference in the parameter document.

The DTM provides an internal topology in the parameter document to inform the frame about the internal structure of the device.

Each channel object delivers a document based on the FDTProfibusChannelParameterSchema in IFdtChannel::GetChannelParameters() for the supported protocol.

6.2.2 Composite Device DTMs

If a DTM is designed as a Composite Device DTM, the BIM DTM provides Communication Channels for connecting the Module DTMs. These channels are not Process Channels.

EXAMPLE 1:
A modular device will be represented by a Composite Device DTM to represent the head station and a number of Module DTMs to represent the modules. The Module DTMs for the modules will provide Process Channels (see Figure 4).

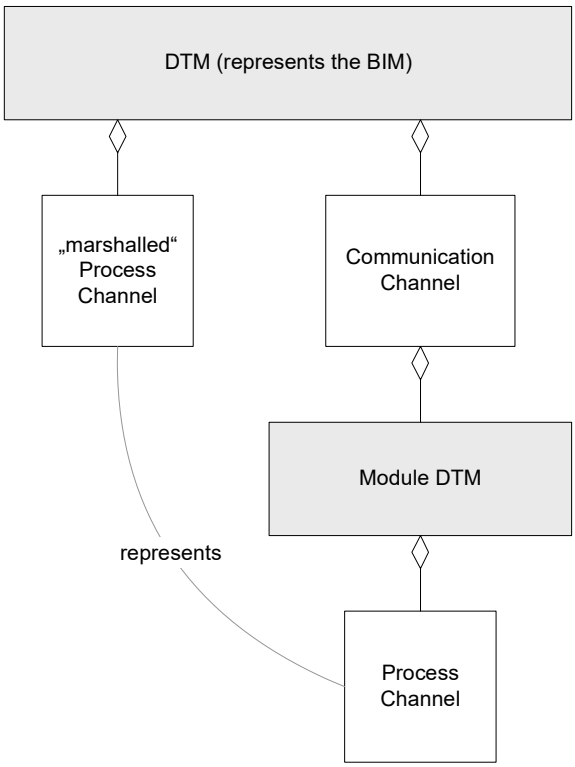

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Figure 4 – Composite Device DTM

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Since the BIM DTM represents the PROFIBUS slave device from the communication point of view, it has to deliver the Process Channels of the complete device. This has the following consequences:

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The BIM DTM shall provide the channel objects in the channel collection that represent its Communication Channels. These channel objects implement the interfaces IFdtCommunication.

The BIM DTM shall provide channel objects in the channel collection representing the Process Channels of the modules. The Process Channels are called “marshalled channel”. These channel objects do not implement the interfaces IFdtCommunication.

The BIM DTM does not provide an internal topology because the project itself with the BIM DTM and the Module DTMs represent the device structure.

The BIM DTM shall provide a channel reference in its parameter document for ALL the channels in the channel collection based on the current configuration.

Each Communication Channel of the BIM DTM delivers a document based on the BasicChannelParameterSchema when it receives IFdtChannel::GetChannelParameters() for any of its supported protocols.

Each marshalled channel of the BIM DTM delivers a document based on the FDTProfibusChannelParameterSchema when it receives IFdtChannel::GetChannelParameters() for any of its supported protocols.

A Module DTM shall deliver a channel reference in its parameter document for each channel.

Each channel of a Module DTM delivers a document based on the FDTProfibusChannelParameterSchema in IFdtChannel::GetChannelParameters() for the supported protocol.