

**Field device tool interface (FDT) specification -
Part 61: Device type manager (DTM) -
Styleguide for common object model
(IEC/TR 62453-61:2009)**

Spécification des interfaces des outils
des dispositifs de terrain (FDT) -
Partie 61: Gestionnaire type
de dispositifs (DMT) -
Guide stylistique
pour le modèle objet commun
(CEI/TR 62453-61:2009)

Field Device Tool (FDT)-
Schnittstellenspezifikation -
Teil 61: Device Type Manager (DTM) -
Leitfaden zur Gestaltung
von Bedienoberflächen
(IEC/TR 62453-61:2009)

This Technical Report was approved by CENELEC on 2009-10-01.

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CENELEC

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

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Foreword

The text of document 65E/72/CDV, future edition 1 of IEC/TR 62453-61, prepared by SC 65E, Devices and integration in enterprise systems, of IEC TC 65, Industrial-process measurement, control and automation, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as CLC/TR 62453-61 on 2009-10-01.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the Technical Report IEC/TR 62453-61:2009 was approved by CENELEC as a Technical Report without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62453-1	2009	Field device tool (FDT) interface specification - Part 1: Overview and guidance	EN 62453-1	2009
IEC 62453-2	2009	Field device tool (FDT) interface specification - Part 2: Concepts and detailed description	EN 62453-2	2009
IEC/TR 62453-41	2009	Field device tool (FDT) interface specification - Part 41: Object model integration profile - Common object model	CLC/TR 62453-41	2009
ISO/IEC 19501	2005	Information technology - Open Distributed Processing - Unified Modeling Language (UML)	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –**Part 61: Device Type Manager (DTM) Styleguide
for common object model**

FOREWORD

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IEC/TR 62453-61, 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:

This part, in conjunction with the other parts of the first edition of the IEC 62453 series cancels and replaces IEC/PAS 62453-1, IEC/PAS 62453-2, IEC/PAS 62453-3, IEC/PAS 62453-4 and IEC/PAS 62453-5 published in 2006, and constitutes a technical revision.

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

Enquiry draft	Report on voting
65E/72/DTR	65E/121/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 publication 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 publication will remain unchanged until the maintenance result 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.

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

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION

This technical report is a user interface design specification for developers of FDT (Field Device Tool) components for Function Control and Data Access within a Client/Server architecture. The technical report is a result of an analysis and design process to develop standard interfaces to facilitate the development of components by multiple vendors that shall interoperate seamlessly.

A device-specific software component, called DTM (Device Type Manager), 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 kinds of fieldbuses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

To ensure the consistent management of a plant-wide control and automation technology, it is necessary to fully integrate fieldbuses, devices and sub-systems as a seamless part of a wide range of automation tasks covering the whole automation life-cycle. This integration also requires a consistent look and feel of device specific components.

Figure 1 shows how IEC/TR 62453-61 is aligned in the structure of the IEC 62453 series.

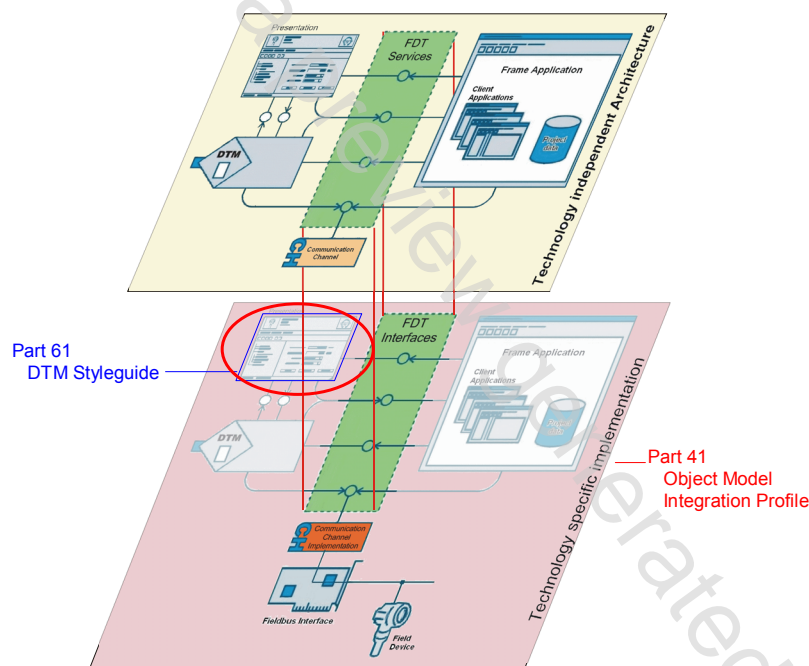


Figure 1 – Part 61 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 61: Device Type Manager (DTM) Styleguide for common object model

1 Scope

IEC/TR 62453-61, which is a technical report, explains the guidelines and rules for the implementation of a Device Type Manager (DTM) with regard to the user interface and its functions. These guidelines and rules are part of the FDT specification and are intended to ensure that all users are provided with clear and consistent user interface functions and features across DTM devices in a system.

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 62453-1:2009, *Field Device Tool (FDT) interface specification – Part 1: Overview and guidance*

IEC 62453-2:2009, *Field Device Tool (FDT) interface specification – Part 2: Concepts and detailed description*

IEC/TR 62453-41:2009, *Field Device Tool (FDT) interface specification – Part 41: Object model integration profile – Common object model*

ISO/IEC 19501:2005, *Information technology – Open Distributed Processing – Unified Modeling Language (UML) Version 1.4.2*

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 the following apply.

3.1.1

screen reader

software application that provides additional output to users (e.g. text-to-sound, braille)

3.1.2

navigation tree

GUI element, which displays the navigation information by means of a tree (e.g. tree control)

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/TR 62453-41 and the following apply.

GUI

Graphical User Interface

SUI	Standard User Interface (a GUI layout defined in this document)
AUI	Advanced User Interface (a GUI layout defined in this document)
CUI	Composition User Interface (a GUI layout defined in this document)
MSAA	Microsoft Active Accessibility
OEM	Original Equipment Manufacturer

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, 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 behavior.
Usage of “can” or “optional”	A DTM may provide the function or behavior depending on the task and type of the DTM. If a function or behavior is provided, it shall follow the style guide.

3.3.3 Specific formatting

The following formatting is used to describe specific context.

CAPITAL LETTERS	Names of keys on the keyboard —for example, SHIFT, CTRL, or ALT.
[Button text]	Button with the specified text.
<Element name>	Name of an XML element according to data type definition in IEC/TR 62453-41.

3.3.4 State machine diagrams

Syntax of the state machine diagrams in this document is defined in IEC 62453-1 and in ISO/IEC 19501:2005.

4 Principles for designing DTM user interfaces

The design of GUIs for DTMs is based on the following general principles for user interface design [4],[5]. These are recommendations for good engineering practice. For additional fundamentals of user interface design, please see the available literature.

Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within an acceptable time limit.

Match between system and the real world

The system should speak the users' language with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

User control and freedom

Users often choose system functions by mistake and need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Error prevention

A careful design which prevents a problem from occurring in the first place is even better than good error messages.

Recognition rather than recall

Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

Flexibility and efficiency of use

Accelerators - unseen by the novice user - may often speed up the interaction for the expert user so that the system can cater to both inexperienced and experienced users. Allow users tailoring of frequent actions.

Aesthetic and minimalist design

Dialogue should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focus on the user's task, list concrete steps to be carried out, and not be too large.

5 Benefits from the FDT user's point of view

Using DTMs compliant with this style guide enables the user to operate more efficiently and more safely. The user is able to parameterize and manage the data of devices from various manufacturers in a uniform way. Therefore, the user is presented with a clearly structured concept regardless of the manufacturer or the type of the device. Details or requirements for developers of a DTM are given within the following clauses.

Guideline and rules are defined for

- uniform user guidance: DTM user interfaces are used and displayed in engineering systems and stand alone tools in the same manner regardless of the device or DTM manufacturer or communication protocol employed;
- uniform behavior of a DTM. This includes:
 - persistent storage,
 - behavior in multi-user environments,
 - error handling;
- clear identification of the DTM and the assigned device;
- ensuring users will be updated on the status and the parameterization of the configuration constantly. All changes of the configuration are marked;
- informing users, whether GUI input affects the device directly or the offline configuration;

- executing plausibility checks of the configuration on a lexical (e.g. only certain characters are accepted), syntactical (e.g. a limited number of characters) and semantically (e.g. given value is below upper limit) correct basis;
- uniform installation/un-installation procedure.

The following screen shots show a Standard User Interface (SUI) (see Figure 2) and an Advanced User Interface (AUI) (Figure 3), two of three possible user interface types (see 7.4.2).

The screenshot displays a software window for configuring a device. At the top left is a red box labeled 'My Device Picture'. To its right, text fields are provided for 'My device name and type', 'My description', and 'DTM specific line (this line is optionally)'. At the top right is another red box labeled 'My Company-Logo'. The main area contains six configuration rows: 'Parameter 1' with a text box containing '18' and units 'kg/s'; 'Parameter 2' with a text box containing '17,8' and units 'bar'; 'Parameter 3' with a text box containing '0,00076' and units 'sec'; 'Parameter 4' with a text box containing '-0,3' and units 'C°', preceded by a pencil icon; 'Selection' with a dropdown menu showing 'select one...'; and another 'Selection' with a dropdown menu showing 'select one...', preceded by a pencil icon. At the bottom right are three buttons: 'OK', 'Cancel', and 'Apply'. At the bottom left is a status bar with icons and labels: a disconnected icon labeled 'Disconnected', a data set icon labeled 'Data set', and a pencil icon.

Figure 2 – Standard User Interface (SUI)

The figure shows a software window titled 'Advanced User Interface (AUI)'. It has a header section with three fields: 'My Device Picture' (with a red box), 'My device name and type', 'My description', and 'DTM specific line (this line is optionally)' (with a red box). Below the header is a tree view on the left labeled 'My Application' containing 'Sub Application 1' through 'Sub Application 5', with 'Sub Application 4' selected. To the right of the tree is a list of parameters: 'Parameter 1' (18 kg/s), 'Parameter 2' (17,8 bar), 'Parameter 3' (0,00076 sec), and 'Parameter 4' (-0,3 C°). Below these are two 'Selection' dropdown menus, both showing 'select one...'. At the bottom are 'OK', 'Cancel', and 'Apply' buttons. A status bar at the very bottom shows 'Disconnected', 'Data set', and several icons.

Figure 3 – Advanced User Interface (AUI)

6 Functions of a DTM

6.1 General

According to IEC/TR 62453-41, a DTM exposes the complete set of available functions with respect to the current state within the XML document returned by IDtm:GetFunctions(). The Frame Application (FA) is responsible for presenting these functions within its overall user interface in a homogeneous way. There should be no break between the DTM based functions and the FDT Frame Application functions.

In general, the Frame Application is responsible for identifying the DTM instance and starting the current function performed by the DTM instance. Such a function can be handled by a specific user interface provided by the DTM. In this case, the Frame Application starts this DTM user interface as integrated application. The Frame Application then shows identification information in a window title bar of this application.

See IEC 62453-2 for a list of predefined applicationIds (Table A.2). Clause 5 in IEC 62453-2 provides information on use cases related to the predefined applicationIds.

6.2 Function “Main operation”

A DTM can have a ‘main operation’ function. This is a special application which aggregates all DTM user interfaces. When ‘main operation’ is started, it shall show a GUI which identifies the device (ie. user interface of application ‘fdtIdentify’).

For providing ‘main operation’ an fdt:StandardFunction entry shall be used with the fdt:applicationId ‘fdtMainOperation’. If ‘main operation’ cannot be assigned to an applicationId, an fdt:Function entry shall be provided (see IEC 62453-2, Table A.13).

6.3 Functions “Online Parameterize” and “Offline Parameterize”

A DTM that allows changing the parameter of a device should provide fdt:StandardFunction for parameterization (applicationIds “fdtOfflineParameterize” and “fdtOnlineParameterize”).

If a DTM offers user interfaces for configuration or parameterization, it shall be possible to use these applications offline as well as online. This means configuration or parameterization shall be possible without a connected device.

7 DTM user interface

7.1 Objective

The user interface of a DTM application shall be designed to provide the user with a software component that is easy to use and self-explanatory. The user interface assists the user to be able to concentrate on his main tasks. The user should not be detracted by novel user interface elements or features.

7.2 General behavior

7.2.1 General

The user interface of a DTM should be based on the Microsoft Windows Style Guide ([3]). It is recommended to use Windows common controls. Windows common controls shall act in the way defined by Microsoft. That means, it is not allowed to change the behavior of common controls like buttons, combo boxes, edit controls, keyboard shortcuts etc.

7.2.2 GUI navigation

Elements of the DTM user interface shall be selectable by a pointing device (e.g. mouse) and with keyboard. The keyboard shortcuts for navigation among GUI areas and objects shall be supported. TAB-key and SHIFT-TAB combination is used for navigation between Application Area, Action Area and optional Navigation Area. The navigation between objects in Application Area shall be possible also with the same shortcuts. The TAB-order of elements within the Application Area is from upper left to lower right corner, at least for languages that are written from left to right. Middle Eastern languages such as Hebrew and Arabic are written predominantly right-to-left. Consequently, Middle Eastern user interfaces require a different layout. The focus shall change to another area, if the TAB-key is pressed on the last element of the current area. Navigation within a tree view shall be possible with arrow keys.

7.2.3 GUI resizeability

A DTM user interface should be implemented in a resizable way. In this case, the DTM is responsible for supporting re-arrangement of the inner controls. If the initial minimum size is reached, the DTM shall not implement scroll bars because the Frame Application is responsible for that.

7.2.4 Display of information

The display of any information in a visual user interface is accomplished in a textual, symbolic or graphic manner.

Only one font family should be used to optimize the readability of texts (system font is recommended). Only a minimum variation of the font size and font style should be used.

Icons defined in this style guide shall be used only in the defined meaning (see 7.4.3.7.2, 7.4.3.8 and 7.5.3.2). Icons used in addition to the defined icons should be plain and unambiguous and oriented towards existing specifications (e.g. operation system common icons). Tool tips are mandatory for all used icons.

Color shall only be used as secondary information. The color set should be kept small. Flashing information should not be used as a further display attribute. In general, a DTM should use the style chosen within the user settings of the operating system (i.e. Windows).

The currently used color scheme should be explained in the online documentation of the DTM.

All definitions and descriptions inside this Style Guide are related to “left-to-right” languages. Middle Eastern languages such as Hebrew and Arabic are written predominantly right-to-left. Consequently, Middle Eastern user interfaces require an adapted layout.

7.3 Microsoft Active Accessibility

Microsoft Active Accessibility (MSAA) [6] is a technology designed to improve the integration of accessibility aids with applications running on Microsoft Windows. MSAA provides a consistent mechanism for exchanging information between applications and assistive technologies. For example, MSAA allows applications to expose screen readers to the type, name, location, and current state of all objects and notifies screen readers of any Windows event that leads to a user interface change.

As a side effect it is possible to use MSAA for fully automated tests of component based software systems. Therefore, a DTM should support MSAA.

User interfaces built with Microsoft common controls typically get full Active Accessibility support without additional development work. However, special attention shall be given if DTM specific user interface controls are used. DTM developers should always verify that these controls are compliant to Active Accessibility requirements.

Basic Principles of Accessible Design

Although, no additional development work is required to support Active Accessibility in many cases, the user interface should always be designed with respect to the following five principles:

- support common system size, color, font, and input settings. This provides a consistent user interface across all applications on the user's system;
- ensure compatibility with the High Contrast option. Users desiring a high degree of legibility select the High Contrast option. When this option is selected several restrictions are imposed upon the user interface. For example, only system colors selectable through the Control Panel or colors set by the user may be used by the user interface;
- provide documented keyboard access to all features. This allows the user to interact with the application without requiring a pointing device, such as a mouse;
- provide notification regarding the location of the keyboard focus (i.e. which element receives keyboard input). It should always be apparent to the user and programmatically which part of the user interface has the focus. This requirement also enables use of the Magnifier and Narrator accessibility aids;
- convey no information by sound alone. User interfaces that convey information by sound shall provide additional options to express this information.

7.4 Appearance

7.4.1 General

Three categories of DTM user interfaces are specified:

- standard layout, where one presentation object displays one application with no or only with limited navigation capability;
- advanced layout, where one presentation object displays one application with advanced navigation capability;

- composite layout, where one presentation object displays multiple applications (for different DTM functions) with advanced navigation capability. The navigation capability also is used for switching between the different applications.

7.4.2 DTM user interface categories

In general, a DTM user interface is divided into the following areas:

- Identification Area: contains information about the device that is handled by the DTM;
- Application Area: contains all necessary GUI elements for the selected function;
- Action Area: contains buttons to initiate the user's choice,
- Status Bar: contains global status information about the DTM and device.

These areas shall be arranged as described in the following sections.

7.4.2.1 Standard User Interface (SUI)

Figure 4 shows the areas for the SUI of a DTM.

Identification Area
Menu ¹⁾
Toolbar ¹⁾
Application Area
Action Area
Status Bar

Key

1) Optional areas

Figure 4 – Areas of an SUI

Additional to the mandatory elements (Identification Area, Application Area, Action Area and Status Bar) the GUI may contain a tool bar and/or a menu.

7.4.2.2 Advanced User Interface (AUI)

Depending on the complexity of a device and the required functionality, the DTM user interface additionally may provide navigation (see Figure 5).

Such a GUI shall be conform to the AUI layout and provide a Navigation Area.

The Navigation Area provides an overview of the whole parameter set that is related to the current function. In other words, the Navigation Area reflects the data structure. The Navigation Area shall be realized as a navigation tree.

Identification Area	
Menu 1)	
Toolbar 1)	
Navigation Area	Application Area
Action Area	
Status Bar	

Key

1) Optional areas

Figure 5 – Areas of an AUI

Additional to the mandatory elements (Identification Area, Navigation Area, Application Area, Action Area and Status Bar) the GUI may contain a tool bar and/or a menu.

7.4.2.3 Composition User Interface (CUI)

The CUI provides access to multiple applications and DTM functions. The user interface is identified with applicationId 'fdtMainOperation' (see 6.2)

The CUI contains the same elements as the AUI.

In contrast to the AUI, the navigation tree shows all integrated applications of the DTM, for example parameterization, diagnosis or device status together with related parameter groups. The left most nodes of the navigation tree shall represent the different DTM applications. All sublevel nodes reflect the structure of data for each application.

7.4.3 DTM user interface areas**7.4.3.1 General**

In general, the user must be aware if modifications of parameters are applied into the data set of the DTM or into the device. Also the behavior of the GUI may vary depending on whether the GUI supports block mode (see 7.5.2.2) or direct mode (see 7.5.2.3).

7.4.3.2 Identification Area

This area contains information about the device that is handled by the DTM (see Table 1).

Table 1 – Contents of Identification Area

Height	Width	Contents (read only)	Availability
Maximal 3 text lines	Variable	Device picture (left side)	Recommended
		Company logo of the device manufacturer (right side, optional home page link: use company logo to directly open a web page in an internet browser)	Recommended
		Between picture and logo:	
		1st line: Device: name attribute of fdt:VersionInformation from DtmDeviceType	Mandatory
		2nd line: Description: Description according [2]	Recommended
		3rd line: DTM specific line (Can be fetched from the device, too)	Optional

7.4.3.3 Menu (optional)

This optional area shall be used only in special cases.

The menu shall contain only menu entries which are directly related to the Application Area. That means if application A is opened within the Application Area the menu shall not contain menu entries of application B.

In a CUI menu entries relating to more than one specific application can also be available.

The selection of such a menu item opens the related application within the Application Area.

7.4.3.4 Tool bar (optional)

This optional area shall be used only in special cases.

The tool bar shall contain only elements which are directly related to the Application Area.

In CUI additional entries relating to more than one specific application may be available.

Also a [Help] button could be part of the tool bar.

7.4.3.5 Navigation Area (conditional)

The Navigation Area is used only in AUI or CUI.

The Navigation Area contains a navigation tree. This tree provides an overview of the whole parameter set. Within the tree the parameter set shall be grouped to appropriate parameter groups.

When selecting a navigation tree entry (leaf or branch) the corresponding parameter group shall be displayed in the Application Area.

The Navigation Area may be hidden or resizable and it can contain scroll bars .

Within a CUI the Navigation Area is also used for selecting different applications. Two approaches are possible:

- a) displaying the applications as left most nodes in the navigation tree (see 7.4.2.3);