

PUBLICLY
AVAILABLE
SPECIFICATION

IEC
PAS 62453-1

Pre-Standard

First edition
2006-05

Field Device Tool (FDT) interface specification –

**Part 1:
Concepts and detailed description**

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

<https://standards.iteh.ai/Catalogue/standards/iec/a71ae1fc-3b1c-4f28-8a4e-1a344c8b07a4/iec-pas-62453-1-2006>



Reference number
IEC/PAS 62453-1:2006(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** (www.iec.ch)
- **Catalogue of IEC publications**
The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.
- **IEC Just Published**
This summary of recently issued publications (www.iec.ch/online_news/justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.
- **Customer Service Centre**
If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: custserv@iec.ch
Tel: +41 22 919 02 11
Fax: +41 22 919 03 00

PUBLICLY
AVAILABLE
SPECIFICATION

IEC
PAS 62453-1

Pre-Standard

First edition
2006-05

Field Device Tool (FDT) interface specification –

**Part 1:
Concepts and detailed description**

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

IEC PAS 62453-1:2006

<https://standards.iteh.ai/catalog/standards/iec/a71ac1fc-3b1c-4f28-8a4e-1a344c8b07a4/iec-pas-62453-1-2006>

© IEC 2006 – Copyright - all rights reserved

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 the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE **XH**

For price, see current catalogue

CONTENTS

FOREWORD.....	11
INTRODUCTION.....	13
1 Scope	14
1.1 Performance.....	14
1.2 Audience.....	14
2 Normative references	15
3 Terms and definitions	15
4 Abbreviations	17
5 Concept	17
5.1 Status	17
5.2 State of the art	18
5.3 Aims.....	18
5.4 Technological orientation.....	19
5.5 Solution concept.....	20
5.6 Migration to Device Type Manager (DTM)	21
6 FDT fundamentals	22
6.1 FDT overview	22
6.2 Where FDT fits	23
6.3 General FDT architecture and components.....	24
6.4 Overview of objects and interfaces.....	25
6.4.1 The Device Type Manager (DTM).....	25
6.4.2 The Block Type Manager (BTM)	26
6.4.3 The FDT Frame Application (FA).....	26
6.5 Synchronization and serialization issues	28
6.6 Parameter interchange via XML.....	28
6.6.1 Examples of usage.....	30
6.7 Persistent storage story	32
6.7.1 Persistence overview	32
6.7.2 Persistence interfaces.....	32
6.8 Basic features of a session model.....	33
6.9 Basic operation phases.....	33
6.9.1 Roles and access rights	33
6.9.2 Operation phases.....	33
6.10 Abstract FDT object model.....	34
6.11 Fieldbus independent integration	37
6.12 Scanning and DTM assignment.....	37
7 FDT version interoperability guidance	37
7.1 Overview	37
7.2 General.....	37
7.3 Component interoperability	38
7.4 FDT type library.....	39
7.5 DTM and device versions.....	39
7.6 Persistence	40
7.7 Nested communication.....	40
7.7.1 Data exchange.....	40
7.7.2 Communication channel upgrade.....	40

7.7.3	Scenarios	41
7.7.4	OnAddChild	41
7.8	Implementation hints	41
7.8.1	Interfaces	41
7.8.2	Persistence	42
8	FDT interface specification	42
8.1	Overview of the FDT interfaces	42
8.2	FDT objects	42
8.2.1	FDT object model	42
8.2.2	DTM state machine	46
8.3	Device Type Manager	50
8.3.1	Interface IDtm	50
8.3.2	Interface IDtm2	59
8.3.3	Interface IDtmActiveXInformation	60
8.3.4	Interface IDtmApplication	62
8.3.5	Interface IDtmChannel	63
8.3.6	Interface IDtmDocumentation	64
8.3.7	Interface IDtmDiagnosis	65
8.3.8	Interface IDtmImportExport	67
8.3.9	Interface IDtmInformation	69
8.3.10	Interface IDtmInformation2	69
8.3.11	Interface IDtmOnlineDiagnosis	70
8.3.12	Interface IDtmOnlineParameter	72
8.3.13	Interface IDtmParameter	74
8.3.14	Interface IFdtCommunicationEvents	75
8.3.15	Interface IFdtCommunicationEvents2	78
8.3.16	Interface IFdtEvents	79
8.3.17	Interface IDtmHardwareIdentification	81
8.3.18	Interface IDtmSingleDeviceDataAccess	83
8.3.19	Interface IDtmSingleInstanceDataAccess	86
8.4	DTM ActiveXControl	88
8.4.1	Interface IDtmActiveXControl	88
8.5	FDT Channel	89
8.5.1	Interface IFdtChannel	89
8.5.2	Interface IFdtChannelActiveXInformation	92
8.5.3	Interface IFdtCommunication	94
8.5.4	Interface IFdtChannelSubTopology	101
8.5.5	Interface IFdtChannelSubTopology2	104
8.5.6	Interface IFdtChannelScan	105
8.5.7	Interface IFdtFunctionBlockData	107
8.6	Channel ActiveXControl	109
8.6.1	Interface IFdtChannelActiveXControl	109
8.6.2	Interface IFdtChannelActiveXControl2	110
8.7	Block Type Manager	111
8.7.1	Interface IBtm	112
8.7.2	Interface IBtmInformation	113
8.7.3	Interface IBtmParameter	113
8.8	BTM ActiveXControl	114
8.8.1	Interface IBtmActiveXControl	114

8.9	Frame Application.....	114
8.9.1	Interface IDtmEvents.....	114
8.9.2	Interface IDtmEvents2.....	123
8.9.3	Interface IDtmScanEvents.....	124
8.9.4	Interface IDtmAuditTrailEvents.....	125
8.9.5	Interface IFdtActiveX.....	127
8.9.6	Interface IFdtActiveX2.....	128
8.9.7	Interface IFdtBulkData.....	132
8.9.8	Interface IFdtContainer.....	133
8.9.9	Interface IFdtDialog.....	136
8.9.10	Interface IFdtTopology.....	137
8.9.11	Interface IDtmRedundancyEvents.....	142
8.9.12	Interface IDtmSingleDeviceDataAccessEvents.....	143
8.9.13	Interface IDtmSingleInstanceDataAccessEvents.....	146
8.9.14	Interface IFdtBtmTopology.....	146
8.10	General concepts.....	147
8.10.1	Task related FDT interfaces.....	147
8.10.2	Return values of interface methods.....	150
8.10.3	Dual interfaces.....	150
8.10.4	Unicode.....	150
8.10.5	Asynchronous vs. synchronous behavior.....	151
8.10.6	ProgIds.....	151
8.10.7	Slave redundancy.....	151
8.10.8	Field bus scanning and DTM assignment.....	154
9	FDT session model and use cases.....	158
9.1	Actors.....	159
9.2	Use cases.....	161
9.2.1	Observation.....	161
9.2.2	Operation.....	162
9.2.3	Maintenance.....	170
9.2.4	Planning.....	179
9.2.5	OEM service.....	187
9.2.6	Administration.....	187
9.3	DTM use case realization.....	188
9.4	Frame Application use case realization.....	194
10	FDT sequence charts.....	196
10.1	DTM peer to peer communication.....	196
10.1.1	Establish a peer-to-peer connection between DTM and device.....	196
10.1.2	Asynchronous connect for a peer-to-peer connection.....	196
10.1.3	Asynchronous disconnect for a peer-to-peer connection.....	197
10.1.4	Asynchronous transaction for a peer-to-peer connection.....	197
10.2	Nested communication.....	198
10.2.1	Generate system topology.....	199
10.2.2	Establish a system connection between DTM and device.....	201
10.2.3	Asynchronous transaction for a system connection.....	202
10.3	Topology scan.....	203
10.3.1	Scan network.....	203
10.3.2	Cancel topology scan.....	204
10.3.3	Provisional scan result notifications.....	204

10.3.4	Scan for communication hardware.....	205
10.3.5	Manufacturer specific device identification.....	206
10.4	Registration of protocol specific FDT schemas.....	208
10.5	Configuration of a fieldbus master.....	210
10.6	Starting and releasing applications.....	211
10.7	Channel access.....	212
10.8	DCS Channel assignment.....	213
10.9	Printing of DTM specific documents.....	217
10.10	Printing of frame application specific documents.....	218
10.11	Propagation of changes.....	219
10.12	Locking.....	220
10.12.1	Locking for non-synchronized DTMs.....	221
10.12.2	Locking for synchronized DTMs.....	222
10.13	Instantiation and release.....	223
10.13.1	Instantiation of a new DTM.....	223
10.13.2	Instantiation of an existing DTM.....	224
10.13.3	Instantiation of a DTM ActiveX user interface.....	224
10.13.4	Release of a DTM user interface.....	225
10.14	Persistent storage of a DTM.....	225
10.14.1	State machine of instance data.....	225
10.14.2	Saving instance data of a DTM.....	227
10.14.3	Reload of a DTM object for another instance.....	228
10.14.4	Copy and versioning of a DTM instance.....	228
10.15	Audit trail.....	228
10.16	Comparison of two instance data sets.....	229
10.16.1	Comparison without user interface.....	229
10.16.2	Comparison with user interface.....	230
10.17	Failsafe data access.....	232
10.18	Set or modify device address with user interface.....	232
10.19	Set or modify known device addresses without user interface.....	233
10.20	Display or modify all child device addresses with user interface.....	234
10.21	Device initiated data transfer.....	235
10.22	Starting and releasing DTM user interface in modal dialog.....	236
10.23	Parent component handling redundant slave.....	237
10.24	Initialization of a channel ActiveX control.....	239
10.24.1	Supports IFdtChannelActiveXcontrol2.....	239
10.24.2	Does not support IFdtChannelActiveXControl2.....	239
10.25	DTM upgrade.....	240
10.25.1	Saving data from a DTM to be upgraded.....	240
10.25.2	Loading data in the replacement DTM.....	242
10.26	Usage of IDtmSingleDeviceDataAccess::ReadRequest / Write Request.....	243
10.27	Instantiation of DTM and BTM.....	244
11	Installation issues.....	246
11.1	Registry and device information.....	246
11.1.1	Visibility of business objects of a DTM.....	246
11.1.2	Component categories.....	246
11.1.3	Registry entries.....	247
11.1.4	Installation issues.....	247
11.1.5	Microsoft's standard component categories manager.....	247

11.1.6	Building a frame application-database of supported devices.....	247
11.1.7	DTM registration	248
12	Description of data types, parameters and structures	249
12.1	Ids	249
12.2	Data type definitions	249
Annex A	(normative) FDT IDL	250
Annex B	(normative) FDT XML schemas	266
B.1	FDTDataTypesSchema	266
B.2	FDTApplicationIdSchema.....	280
B.3	FDTUserInformationSchema	281
B.4	DTMInformationSchema	282
B.5	DTMFunctionCallSchema.....	286
B.6	DTMParameterSchema.....	287
B.7	DTMDocumentationSchema	295
B.8	DTMProtocolsSchema	297
B.9	DTMSystemTagListSchema	298
B.10	DTMAuditTrailSchema	299
B.11	DTMDeviceStatusSchema.....	301
B.12	DTMFunctionsSchema.....	302
B.13	DTMChannelFunctionsSchema	306
B.14	DTMOnlineCompareSchema.....	308
B.15	FDTFailSafeDataSchema.....	309
B.16	DTMTopologyScanSchema.....	310
B.17	FDTOperationPhaseSchema.....	310
B.18	DTMInitSchema.....	311
B.19	FDTUserMessageSchema.....	312
B.20	DTMInfoListSchema.....	313
B.21	FDTTopologyImportExportSchema.....	314
B.22	DTMDeviceListSchema.....	318
B.23	DTMSystemGuiLabelSchema.....	320
B.24	DTMStateSchema.....	321
B.25	DTMEnvironmentSchema.....	322
B.26	FDTConnectResponseSchema.....	322
B.27	TypeRequestSchema.....	323
B.28	FDTScanRequestSchema.....	323
B.29	FDTxxxIdentSchema.....	324
B.30	FDTxxxDeviceTypeIdentSchema.....	325
B.31	FDTxxxScanIdentSchema.....	325
B.32	DTMIdentSchema.....	325
B.33	DTMScanIdentSchema	326
B.34	DTMDeviceTypeIdentSchema	328
B.35	DTMItemListSchema.....	330
B.36	BtmDataTypesSchema	335
B.37	BtmInformationSchema.....	337
B.38	BtmParameterSchema	338
B.39	BtmInitSchema	340
B.40	BtmInfoListSchema.....	340
Annex C	(informative) FDT XML Styles - Documentation.....	341

Annex D (normative) FDT XSL Transformation	345
D.1 Identification transformation.....	345
D.2 Hint:.....	345
Annex E (normative) Channel schema.....	347
E.1 FDTBasicChannelParameterSchema.....	347
E.2 Template for Channel Schema.....	348
Annex F (informative) History – List of changes.....	349
BIBLIOGRAPHY	351
Figure 1 – Different tools and multiple data input have determined field device integration to date.....	18
Figure 2 – The potential of the field bus technology cannot be used until the field bus has been homogeneously integrated into the engineering systems.....	19
Figure 3 – DTM - implementations.....	22
Figure 4 – General FDT Client/Server relationship.....	23
Figure 5 – Channel/Parameter relationship.....	23
Figure 6 – FDT interfaces	24
Figure 7 – DTM interfaces.....	25
Figure 8 – Example of device architecture and components.....	26
Figure 9 – Frame Application interfaces.....	27
Figure 10 – The FDT communication layers.....	28
Figure 11 – FDT Client/Server relationship via XML.....	29
Figure 12 – Data access and storage.....	30
Figure 13 – Communication.....	30
Figure 14 – Documentation.....	31
Figure 15 – Parameter verification in case of failsafe devices.....	31
Figure 16 – FDT objects - device related.....	35
Figure 17 – FDT objects- DTM, DtmActiveXControl and Frame Application.....	43
Figure 18 – FDT objects- FdtChannel.....	44
Figure 19 – FDT objects-- BTM and BtmActiveXControl.....	45
Figure 20 – FDT data types.....	45
Figure 21 – State machine of a DTM.....	46
Figure 22 – Redundancy scenarios	152
Figure 23 – Device identification	154
Figure 24 – Structural overview.....	155
Figure 25 – UML syntax.....	158
Figure 26 – Use case – “Main”	159
Figure 27 – Actor “Observer”.....	161
Figure 28 – Use case – “Operation”.....	162
Figure 29 – Realization of use case “User Login”.....	163
Figure 30 – Realization of use case “Online View”.....	165
Figure 31 – Realization of use case “Audit Trail”.....	166
Figure 32 – Realization of use case “Archive”.....	167
Figure 33 – Realization of use case “Report Generation ”.....	168

Figure 34 – Realization of use case “Asset Management”	169
Figure 35 – Use case – “Maintenance”	170
Figure 36 – Realization of use case “Simulation”	171
Figure 37 – Realization of use case “Offline Operation”	173
Figure 38 – Realization of use case “Repair”	174
Figure 39 – Realization of use case “DTM Upgrade and Replacement”	175
Figure 40 – Realization of use case “Online Operation”	177
Figure 41 – Realization of use case “Bulk Data Handling”	178
Figure 42 – Use case – “Planning”	179
Figure 43 – Realization of use case “DTM Instance Handling”	181
Figure 44 – Realization of use case “Configuration”	182
Figure 45 – Realization of use case “System Generation”	183
Figure 46 – Realization of use case “System Planning”	185
Figure 47 – Realization of use case “List of Supported Devices”	186
Figure 48 – No use case for actor “OEM Service”	187
Figure 49 – Use case – “Administration”	187
Figure 50 – Realization of use case “Integration”	188
Figure 51 – Peer to peer connection between DTM and device	196
Figure 52 – Asynchronous connect (peer to peer)	196
Figure 53 – Asynchronous disconnect (peer to peer)	197
Figure 54 – Asynchronous transaction (peer to peer)	198
Figure 55 – System-topology	199
Figure 56 – Generation of system topology by Frame Application	200
Figure 57 – Generation of system topology – participation of DTM	201
Figure 58 – System connection (across communication hierarchy)	201
Figure 59 – Asynchronous transactions (system connection)	202
Figure 60 – Scan network topology	203
Figure 61 – Cancel topology scan	204
Figure 62 – Provisional topology scan	205
Figure 63 – Scan for communication hardware	206
Figure 64 – Manufacturer specific device identification	207
Figure 65 – Add protocol specific schemas to Frame Applications schema sub path	209
Figure 66 – Frame Application reads protocol specific device identification information of DTMDeviceTypes	210
Figure 67 – Bus master configuration	211
Figure 68 – Starting and releasing applications	212
Figure 69 – Channel access	213
Figure 70 – DCS channel assignment single DTM	214
Figure 71 – Sequence of channel assignment for a single DTM	215
Figure 72 – Modular DTM structure	216
Figure 73 – Channel assignment for modular DTMs	217
Figure 74 – Printing of DTM specific documents	218
Figure 75 – Printing of frame application specific documents	219

Figure 76 – Propagation of changes	220
Figure 77 – Locking for non-synchronized DTMs	221
Figure 78 – Locking for synchronized DTMs	222
Figure 79 – Instantiation of a new DTM	223
Figure 80 – Instantiation of an existing DTM.....	224
Figure 81 – Instantiation of a DTM user interface	224
Figure 82 – Release of a DTM user interface.....	225
Figure 83 – State machine of instance data set	226
Figure 84 – Persistence states of a data set.....	227
Figure 85 – Saving instance data of a DTM	227
Figure 86 – Copy and versioning of a DTM instance	228
Figure 87 – Audit trail	229
Figure 88 – Comparison without user interface	230
Figure 89 – Comparison with user interface.....	231
Figure 90 – Failsafe data access.....	232
Figure 91 – Set or modify device address with user interface.....	233
Figure 92 – Set or modify known device addresses without user interface.....	234
Figure 93 – Display or modify all child device addresses with user interface.....	235
Figure 94 – Device initiated data transfer	236
Figure 95 – Modal DTM user interface.....	237
Figure 96 – Handling of a redundant slave.....	238
Figure 97 – Init of channel ActiveX with IFdtChannelActiveXControl2.....	239
Figure 98 – Init of channel ActiveX without IFdtChannelActiveXControl2.....	240
Figure 99 – Saving data from a DTM to be upgraded	241
Figure 100 – Loading data in the replacement DTM	242
Figure 101 – Usage of IDtmSingleDeviceDataAccess	243
Figure 102 – General sequence of creation and instantiation of blocks.....	245
Figure 103 – XSLT role.....	346
Table 1 – Operation phases	34
Table 2 – Description of FDT objects.....	35
Table 3 – Relations between FDT objects.....	36
Table 4 – Interoperability between components of different versions	38
Table 5 – Availability of DTM methods in different states	47
Table 6 – Availability of Frame Application interfaces	49
Table 7 – Task related DTM interfaces	147
Table 8 – Task related DTM-ActiveX interfaces	148
Table 9 – Task related Channel interfaces.....	148
Table 10 – Task related Channel-ActiveX interfaces	149
Table 11 – Task related BTM interfaces	149
Table 12 – Task related BTM-ActiveX interfaces.....	149
Table 13 – Task related Frame Application interfaces.....	150
Table 14 – Semantic identification information.....	156

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Field Device Tool (FDT) interface specification –**Part 1: Concepts and detailed description**

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is a technical specification not fulfilling the requirements for a standard but made available to the public.

IEC-PAS 62453-1 has been processed by subcommittee 65C: Digital communications, of IEC technical committee 65: Industrial-process measurement and control.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
65C/398A/NP	65C/411/RVN

Following publication of this PAS, which is a pre-standard, the technical committee or subcommittee concerned will transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of three years starting from 2006-05. The validity may be extended for a single three-year period, following which it shall be revised to become another type of normative document or shall be withdrawn.

IEC 62453 consists of the following parts under the general title *Field Device Tool (FDT) interface specification*:

Part 1: Concepts and detailed description

Part 2: INTERBUS communication

Part 3: PROFIBUS communication

Part 4: HART communication

Part 5: FOUNDATION FIELDBUS communication

Withdrawing

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

<https://standards.iteh.ai/standards/iec/a4d9efc-3b1c-4f28-8a4e-1a344c8b07a4/iec-pas-62453-1-2006>