IEC TR 62453-51-31

Edition 1.0 2017-06

TECHNICAL REPORT

colour inside

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

IEC TR 62453-51-31:2017-06(en)

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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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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

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- withdrawn,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

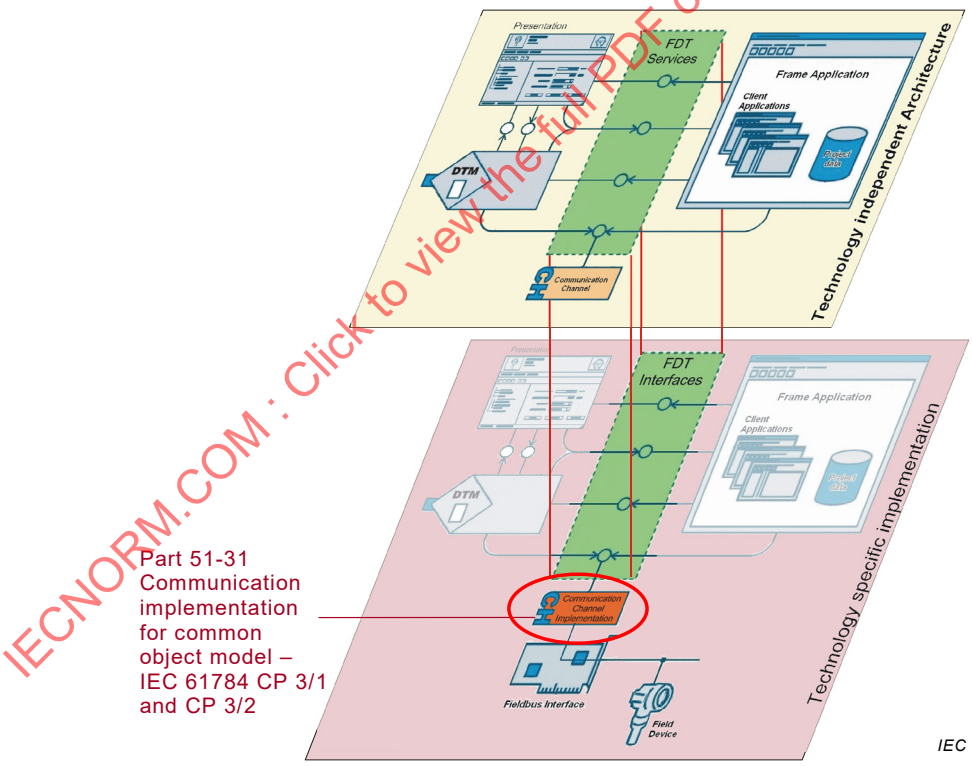

Figure 1 – Part 51-31 of the IEC 62453 series

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.

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 62453-41:2016, *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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- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

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.

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.

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).

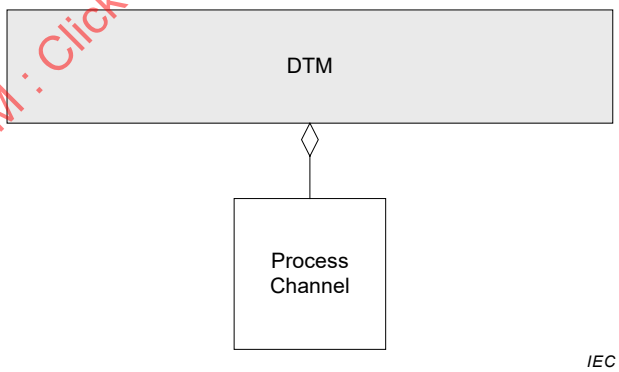

Figure 2 – Device DTM

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).

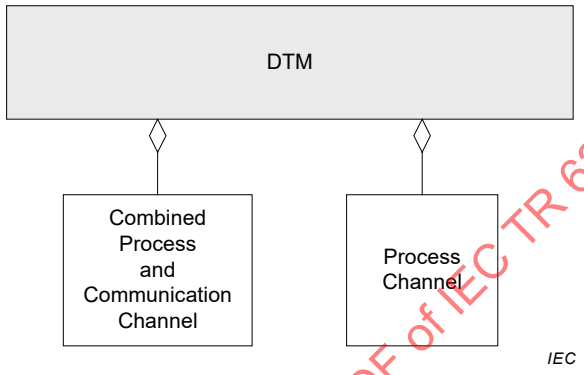

Figure 3 – Gateway DTM

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 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).

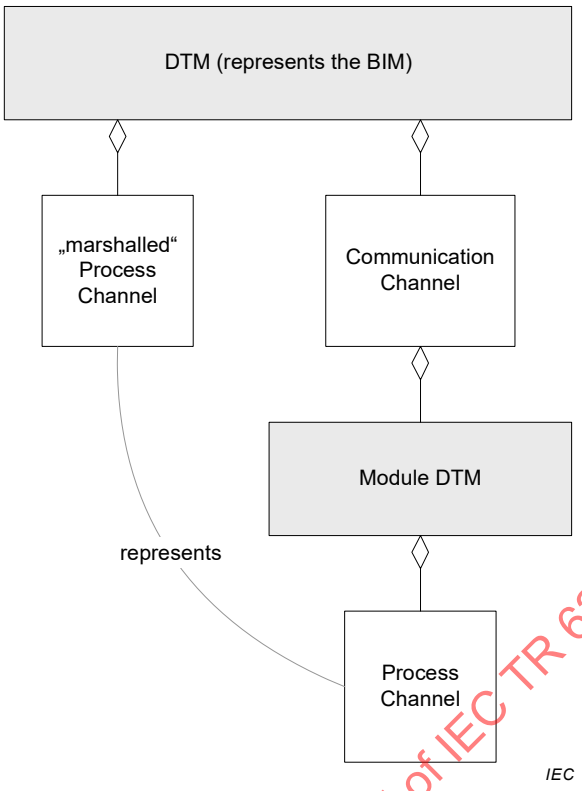

Figure 4 – Composite Device DTM

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:

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.

Every time when a module changes the configuration so that the Process Channels (configuration or amount of Process Channels) changes, the BIM shall update the Process Channels and the parameter document.

When a module is added or removed from the BIM, the BIM shall add/remove the Process Channels of this module and update the parameter document.

EXAMPLE 2:
When a modular I/O system as described by EXAMPLE 1 of 6.2.2 also has some modules which provide HART communication, it 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 communication modules will provide Communication Channels. These channels represent also Process Channels.
Modules that are not used for communication will provide Process Channels only (see Figure 5).

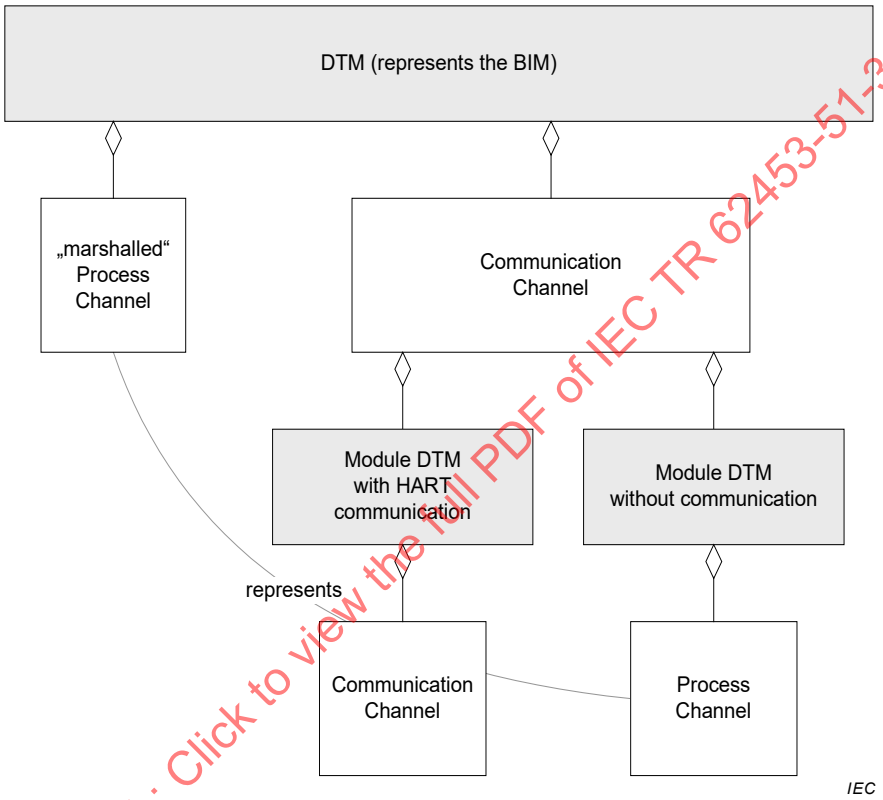

Figure 5 – Modular Gateway DTM

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

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 shall deliver a channel reference in its parameter document for *all* the channels in the channel collection based on the current configuration.

The BIM does not provide an internal topology because the project itself with the BIM 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 provide a channel reference in its parameter document for each channel (if applicable).

Each channel of a Module DTM delivers a document based on the Basic Channel Schema when it receives IFdtChannel::GetChannelParameters() for any of its supported or required protocols.

Every time a module changes the configuration so that the Process Channels (configuration or amount of Process Channels) changes, the BIM shall update the Process Channels and the parameter document.

When a module is added or removed from the BIM, the BIM shall add/remove the process channels of this module and update the parameter document.

6.3 Interfaces and information related to Bus Master Configuration

Figure 6 shows the interfaces and methods related to establishing DPV0 functionality in DCS environments. The interface IFdtTopology is required only for a Composite Device DTM.

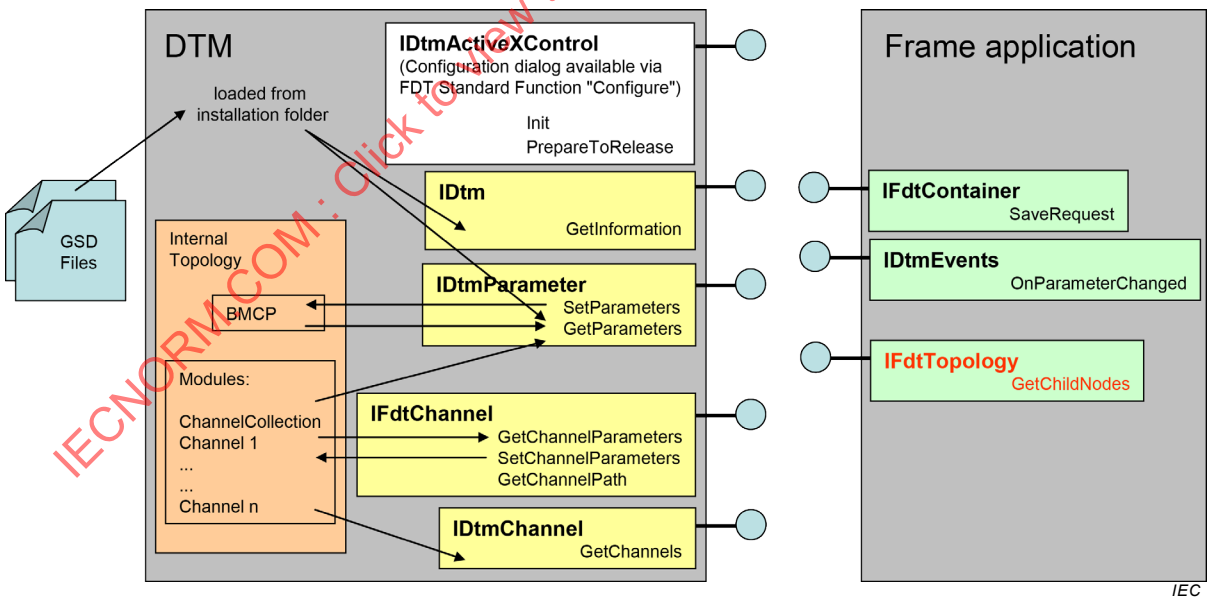

Figure 6 – Interfaces and information related to bus master configuration

NOTE The BMCP contains (besides other parts) two important parts called Prm_Data and Cfg_Data. Often these two parts are called Parameter-String and Config-String.

6.4 Configuration changes in a device

The sequence related to configuration changes is shown in Figure 7.

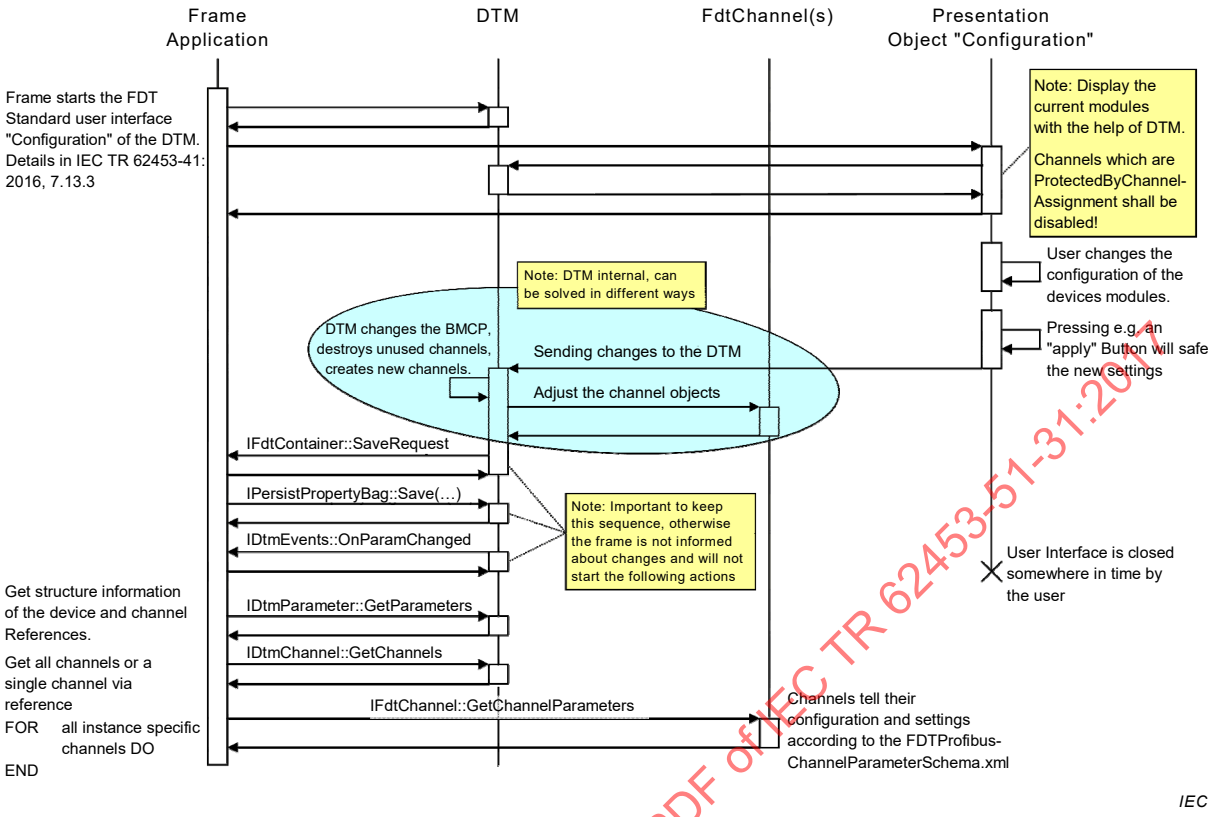

Figure 7 – Changes by the user to the configuration of a device in the DTM user interface

6.5 Error behaviour: DTM refuses new BMCP

A DTM is expected to check the BMCP and may refuse an incorrect BMCP (see Figure 8).

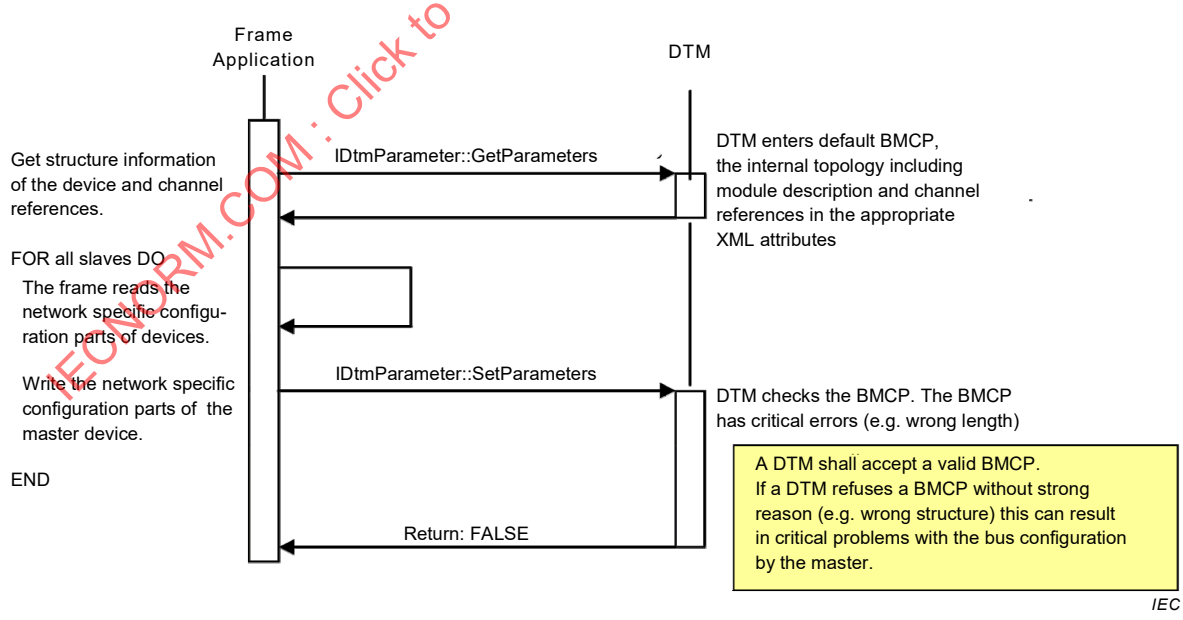

Figure 8 – Error case – DTM refuses the new BMCP from the Frame Application

7 Protocol specific usage of general data types

Table 1 shows how general data types are used with IEC 61784 CP 3/1 and CP 3/2 devices.

Table 1 – Protocol specific usage of general data types

Attribute	Description for use
fdt:address	All these attributes of the FDTDatatype schema are used as defined in IEC 62453-303-1.
fdt:protocolId	
fdt:deviceTypeId	
fdt:deviceTypeInformation	
fdt:deviceTypeInformationPath	
fdt:manufacturerId	
fdt:semanticId fdt:applicationDomain	
fdt:tag	

8 Network management data types

8.1 General

The data types specified in this clause are used at the following methods:

- IDtmParameter:GetParameters
- IDtmParameter:SetParameters

8.2 PROFIBUS device address

The address of a PROFIBUS device is available at the attribute <BusInformation/@masterSlaveAddress>.

8.3 Master-bus parameter set

The parameter set represents the content of the attribute busMasterConfigurationPart within the DTMParameterSchema for Profibus master device. This attribute shall be set for each Profibus master device according to the IEC 61158 series. For further details, refer to 6.3 of IEC 62453-2:2016, Clause 9 of IEC 62453-303-1:2009/AMD1:2016 and the IEC 61158 series.

8.4 Slave bus parameter set

The parameter set represents the content of the attribute busMasterConfigurationPart within the DTMParameterSchema for Profibus slave devices. This attribute shall be set for each Profibus slave device according to the IEC 61158 series. For further details, refer to 6.3 of IEC 62453-2:2016, Clause 9 of IEC 62453-303-1:2009/AMD1:2016 and the IEC 61158 series.

8.5 Module and channel data

Corresponding XML documents:

- DTM Parameters:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:DTMParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml"
fdt:storageState="persistant"  fdt:dataSetState="default">
    <fdt:DtmDeviceType>
        <fdt:VersionInformation name="LB 8101" vendor="RIO Manufacturer" version="1.0" date="2000-08”05"/>
        <fdt:SupportedLanguages>
```

```
            <fdt:LanguageId languageid="1"/>
        </fdt:SupportedLanguages>
        <fdt:BusCategories>
            <fdt:BusCategory busCategory="036D1497-387B-11D4-86E1-00E098727”B9"/>
            <fdt:BusCategory busCategory="036D1499-387B-11D4-86E1-00E098727”B9"/>
        </fdt:BusCategories>
    </fdt:DtmDeviceType>
    <DtmDevice fdt:tag="00PGH10EC”01">
        <InternalTopology>
            <InternalChannel>
                <Module moduleid="1" slot="1">
                    <fdt:VersionInformation name="LB/FB 1”03" vendor="RIO Manufacturer" versio="10" date="2000-08”05"
descriptor="Digital Input (Counter 4 Byte"/>
                    <fdt:ChannelReferences>
                        <fdt:ChannelReference idref="Count_”_0"/>
                    </fdt:ChannelReferences>
                </Module>
            </InternalChannel>
            <InternalChannel>
                <Module moduleid="8" slot="8">
                    <fdt:VersionInformation name="1DO / 2DI" vendor="Vendor name" version="".0" date="2000-08”05"
descriptor="Valve Block LB/FB 2XXX 1Byte Input Output"/>
                    <fdt:ChannelReferences>
                        <fdt:ChannelReference idref="DI_8LFO”T0"/>
                        <fdt:ChannelReference idref="DI_”_1"/>
                        <fdt:ChannelReference idref="DI_8_”F1"/>
                        <fdt:ChannelReference idref="DI_”_2"/>
                        <fdt:ChannelReference idref="DI_8_”F2"/>
                        <fdt:ChannelReference idref="DO_”_0"/>
                    </fdt:ChannelReferences>
                </Module>
            </InternalChannel>
        </InternalTopology>
    </DtmDevice>
</FDT>
```

- FDT-Channel “Count_1_0”:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType>
        <fdt:VersionInformation name="Digital Input (Counter 4 Byte)" vendor="RIO Manufacturer" version="1.0"
                                date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="00PGH10EB001" fdt:id="Count_0_1" protectedByChannelAssignment="0" number="0"
                fdt:dataType="int" fdt:signalType="input">
        <DpAddress bitPosition="0" bitLength="32"/>
    </FDTChannel>
</FDT>
```

- FDT-Channel “DI_8_LFOUT0”:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType statusChannel="1">
        <fdt:VersionInformation name="Digital Input Valve Block" vendor="RIO Manufacturer" version="1.0"
                                date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="00PGH10FB001" fdt:id="DI_8LFOUT0" protectedByChannelAssignment="0" number="10"
                fdt:dataType="binary" fdt:signalType="input">
        <DpAddress bitPosition="33" bitLength="1"/>
    </FDTChannel>
</FDT>
```

- FDT-Channel “DI_8_1”:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType>
        <fdt:VersionInformation name="Digital Input Valve Block" vendor="RIO Manufacturer" version="1.0"
                                date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="00PGH10EB002" fdt:id="DI_8_1" protectedByChannelAssignment="0" number="1"
                fdt:dataType="binary" fdt:signalType="input">
```

```
        <DpAddress bitPosition="34" bitLength="1"/>
        <StatusInformation logic="positive" invalidBit="35"/>
    </FDTChannel>
</FDT>
```

- FDT-Channel “DI_8_LF1”:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType statusChannel="1">
        <fdt:VersionInformation name="Digital Input Valve Block" vendor="RIO Manufacturer" version="1.0"
                                date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="00PGH10FB002" fdt:id="DI_8_LF1" protectedByChannelAssignment="0" number="11"
                fdt:dataType="binary" fdt:signalType="input">
        <DpAddress bitPosition="35" bitLength="1"/>
    </FDTChannel>
</FDT>
```

- FDT-Channel “DI_8_2”:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType>
        <fdt:VersionInformation name="Digital Input Valve Block" vendor="RIO Manufacturer" version="1.0"
                                date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="00PGH10EB003" fdt:id="DI_8_2" protectedByChannelAssignment="0" number="2"
                fdt:dataType="binary" fdt:signalType="input">
        <DpAddress bitPosition="36" bitLength="1"/>
        <StatusInformation logic="positive" invalidBit="37"/>
    </FDTChannel>
</FDT>
```

- FDT-Channel “DI_8_LF2”:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType statusChannel="1">
        <fdt:VersionInformation name="Digital Input Valve Block" vendor="RIO Manufacturer" version="1.0"
                                date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="00PGH10FB003" fdt:id="DI_8_LF2" protectedByChannelAssignment="0" number="12"
                fdt:dataType="binary" fdt:signalType="input">
        <DpAddress bitPosition="37" bitLength="1"/>
    </FDTChannel>
</FDT>
```

- FDT-Channel “DO_8_0”:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType>
        <fdt:VersionInformation name="Digital Output Valve Block" vendor="RIO Manufacturer" version="1.0"
                                date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="00PGH10EB004" fdt:id="DO_8_0" protectedByChannelAssignment="0" number="3"
                fdt:dataType="binary" fdt:signalType="output">
        <DpAddress bitPosition="0" bitLength="1"/>
        <StatusInformation logic="positive" invalidBit="32"/>
    </FDTChannel>
</FDT>
```


9 Communication data types

9.1 General

The data types specified in this clause are used with the methods of IFdtCommunication.

9.2 DPV0 communication – FDTProfibusDPV0CommunicationSchema

The XML document contains the address information and the communication data needed for DP communication. The definition of the attributes and elements follows the data type definition as defined in IEC 62453-303-1.

```
<Schema name="FDTProfibusDPV0CommunicationSchema" xmlns="urn:schemas-microsoft-com:xml-data"
xmlns:dt="urn:schemas-microsoft-com:datatypes" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <!--Definition of Attributes-->
    <AttributeType name="schemaVersion" dt:type="number" default="1.21"/>
    <AttributeType name="busAddress" dt:type="ui1"/>
    <AttributeType name="errorCode" dt:type="bin.hex"/>
    <AttributeType name="communicationReference" dt:type="uuid"/>
    <AttributeType name="connectStatus" dt:type="enumeration" dt:values="masterConnectedOnly deviceAtLifeList
deviceInDataExchange "/>
    <AttributeType name="sequenceTime" dt:type="ui4"/>
    <AttributeType name="delayTime" dt:type="ui4"/>
    <!--Definition of Elements-->
    <ElementType name="ConnectRequest" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="fdt:systemTag" required="no"/>
    </ElementType>
    <ElementType name="ConnectResponse" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="connectStatus" required="yes"/>
    </ElementType>
    <ElementType name="DisconnectRequest" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="DisconnectResponse" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="ReadUserParameterRequest" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="ReadUserParameterResponse" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
        <element type="fdt:CommunicationData" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="WriteUserParameterRequest" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <element type="fdt:CommunicationData" minOccurs="1" maxOccurs="1"/>
    </ElementType>
    <ElementType name="WriteUserParameterResponse" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
    </ElementType>
    <ElementType name="ReadOutputDataRequest" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <element type="fdt:ChannelReference" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="ReadOutputDataResponse" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
        <element type="fdt:CommunicationData" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="WriteOutputDataRequest" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <element type="fdt:ChannelReference" minOccurs="1" maxOccurs="1"/>
        <element type="fdt:CommunicationData" minOccurs="1" maxOccurs="1"/>
    </ElementType>
```

```
    <ElementType name="WriteOutputDataResponse" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
    </ElementType>
    <ElementType name="ReadInputDataRequest" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <element type="fdt:ChannelReference" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="ReadInputDataResponse" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
        <element type="fdt:CommunicationData" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="ReadDiagnosisDataRequest" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="ReadDiagnosisDataResponse" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
        <element type="fdt:CommunicationData" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="SequenceBegin" content="empty" model="closed">
        <attribute type="sequenceTime" required="no"/>
        <attribute type="delayTime" required="no"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="SequenceEnd" content="empty" model="closed">
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="SequenceStart" content="empty" model="closed">
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="Abort" content="empty" model="closed">
<attribute type="communicationReference" required="no"/>
</ElementType>
    <ElementType name="FDT" content="eltOnly" model="closed">
        <attribute type="schemaVersion" required="no"/>
        <attribute type="fdt:nodeId" required="no"/>
        <group order="one">
            <element type="ConnectRequest"/>
            <element type="ConnectResponse"/>
            <element type="DisconnectRequest"/>
            <element type="DisconnectResponse"/>
            <element type="ReadUserParameterRequest"/>
            <element type="ReadUserParameterResponse"/>
            <element type="WriteUserParameterRequest"/>
            <element type="WriteUserParameterResponse"/>
            <element type="ReadOutputDataRequest"/>
            <element type="ReadOutputDataResponse"/>
            <element type="WriteOutputDataRequest"/>
            <element type="WriteOutputDataResponse"/>
            <element type="ReadInputDataRequest"/>
            <element type="ReadInputDataResponse"/>
            <element type="ReadDiagnosisDataRequest"/>
            <element type="ReadDiagnosisDataResponse"/>
            <element type="SequenceBegin"/>
            <element type="SequenceEnd"/>
            <element type="SequenceStart"/>
            <element type="Abort"/>
            <element type="fdt:CommunicationError"/>
        </group>
    </ElementType>
</Schema>
```


9.3 DPV1 communication – FDTProfibusDPV1CommunicationSchema

The XML document contains the address information and the communication data needed for MSAC2 communication. The definition of the attributes and elements follows the data type definition as defined in IEC 62453-303-1.

Within a connect request, a DTM of a Profibus redundant slave can provide additional redundant slave addresses, set within its parameter document. The busAddress attribute shall be used as preferred address. The addresses in the redundantAddresses element should be used if an alternative address may be used to connect to the redundant slave.

```
<Schema name="FDTProfibusDPV1CommunicationSchema" xmlns="urn:schemas-microsoft-com:xml-data"
xmlns:dt="urn:schemas-microsoft-com:datatypes" xmlns:fdt="x-schema:FDTDataTypesSchema.xml" xmlns:fdtparam="x-
schema:DTMParameterSchema.xml">
    <!--Definition of Attributes-->
    <AttributeType name="schemaVersion" dt:type="number" default="1.21"/>
    <AttributeType name="api" dt:type="ui1"/>
    <AttributeType name="busAddress" dt:type="ui1"/>
    <AttributeType name="errorCode" dt:type="bin.hex"/>
    <AttributeType name="index" dt:type="ui1"/>
    <AttributeType name="communicationReference" dt:type="uuid"/>
    <AttributeType name="slot" dt:type="ui1"/>
    <AttributeType name="sequenceTime" dt:type="ui4"/>
    <AttributeType name="delayTime" dt:type="ui4"/>
    <AttributeType name="maxLenDataUnit" dt:type="ui1"/>
    <AttributeType name="scl" dt:type="ui1"/>
    <AttributeType name="networkMACAddress" dt:type="bin.hex"/>
    <!--Definition of Elements-->
    <ElementType name="redundantAddresses" content="eltOnly" model="closed">
        <element type="fdtparam:SlaveAddress" maxOccurs="*" minOccurs="1"/>
    </ElementType>

    <ElementType name="NetworkAddress" content="empty" model="closed">
        <attribute type ="api" required="yes"/>
        <attribute type ="scl" required="yes"/>
        <attribute type ="networkMACAddress" required="yes"/>
    </ElementType>
    <ElementType name="srcNetworkAddress" content="eltOnly" model="closed">
        <element type="NetworkAddress" minOccurs="1" maxOccurs="1"/>
    </ElementType>
    <ElementType name="destNetworkAddress" content="eltOnly" model="closed">
        <element type="NetworkAddress" minOccurs="1" maxOccurs="1"/>
    </ElementType>
    <ElementType name="ConnectRequest" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="api" required="yes"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="fdt:systemTag" required="no"/>
            <element type="redundantAddresses" maxOccurs="1" minOccurs="0"/>
        <element type="srcNetworkAddress" minOccurs="0" maxOccurs="1"/>
        <element type="destNetworkAddress" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="ConnectResponse" content=" eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="api" required="yes"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
        <attribute type="maxLenDataUnit" required="no"/>
            <element type="redundantAddresses" maxOccurs="1" minOccurs="0"/>
        <element type="srcNetworkAddress" minOccurs="0" maxOccurs="1"/>
        <element type="destNetworkAddress" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="DisconnectRequest" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="api" required="yes"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="DisconnectResponse" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="api" required="yes"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
    </ElementType>
    <ElementType name="ReadRequest" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="slot" required="yes"/>
        <attribute type="index" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
```

```
    <ElementType name="ReadResponse" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="slot" required="yes"/>
        <attribute type="index" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
        <element type="fdt:CommunicationData" minOccurs="1" maxOccurs="1"/>
    </ElementType>
    <ElementType name="WriteRequest" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="slot" required="yes"/>
        <attribute type="index" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
        <element type="fdt:CommunicationData" minOccurs="1" maxOccurs="1"/>
    </ElementType>
    <ElementType name="WriteResponse" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="slot" required="yes"/>
        <attribute type="index" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
    </ElementType>
    <ElementType name="SequenceBegin" content="empty" model="closed">
        <attribute type="sequenceTime" required="no"/>
        <attribute type="delayTime" required="no"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="SequenceEnd" content="empty" model="closed">
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="SequenceStart" content="empty" model="closed">
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="Abort" content="empty" model="closed">
        <attribute type="communicationReference" required="no"/>
    </ElementType>
    <ElementType name="FDT" content="eltOnly" model="closed">
        <attribute type="schemaVersion" required="no"/>
        <attribute type="fdt:nodeId" required="no"/>
        <group order="one">
            <element type="ConnectRequest"/>
            <element type="ConnectResponse"/>
            <element type="DisconnectRequest"/>
            <element type="DisconnectResponse"/>
            <element type="ReadRequest"/>
            <element type="ReadResponse"/>
            <element type="WriteRequest"/>
            <element type="WriteResponse"/>
            <element type="SequenceBegin"/>
            <element type="SequenceEnd"/>
            <element type="SequenceStart"/>
            <element type="Abort"/>
            <element type="fdt:CommunicationError"/>
        </group>
    </ElementType>
</Schema>
```

Example:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusDPV1CommunicationSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <ReadResponse slot="1" index="1" communicationReference="13966300-d860-4d18-8bc3-f11f8c9d7597"
errorCode="0000000000">
        <fdt:CommunicationData byteArray="FF01"/>
    </ReadResponse>
</FDT>
```

Example for redundancy:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusDPV1CommunicationSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml"
xmlns:fdtparam="x-schema:DTMParameterSchema.xml">
    <ConnectRequest api="4" busAddress="1">
        <redundantAddresses>
            <fdtparam:SlaveAddress slaveAddress="2"/>
```

```
            <fdtparam:SlaveAddress slaveAddress="3"/>
        </redundantAddresses>
    </ConnectRequest>
</FDT>
```

10 Channel parameter data types

The ChannelParameter XML document describes how to access a channel via a Profibus DPV1 command or how to adress a channel within a Profibus DP frame for cyclic I/O. The definition of the attributes and elements follows the data type definition as defined in IEC 62453-303-1.

The data types specified in this clause are used with the following methods:

- IFdtChannel::GetChannelParameters()
- IFdtChannel::SetChannelParameters()

```
<Schema name="FDTProfibusChannelParameterSchema" xmlns="urn:schemas-microsoft-com:xml-data"
xmlns:dt="urn:schemas-microsoft-com:datatypes" xmlns:fdt="x-schema:FDTDataTypesSchema.xml" xmlns:appId="x-
schema:FDTApplicationIdSchema.xml">
    <!--Definition of Attributes-->
    <AttributeType name="schemaVersion" dt:type="number" default="1.21"/>
    <AttributeType name="api" dt:type="ui1"/>
    <AttributeType name="bitLength" dt:type="ui4"/>
    <AttributeType name="bitPosition" dt:type="ui4"/>
    <AttributeType name="frameApplicationTag" dt:type="string"/>
    <AttributeType name="gatewayBusCategory" dt:type="uuid"/>
    <AttributeType name="invalidBit" dt:type="ui4"/>
    <AttributeType name="index" dt:type="ui1"/>
    <AttributeType name="logic" dt:type="enumeration" dt:values="positive negative"/>
    <AttributeType name="number" dt:type="ui4"/>
    <AttributeType name="protectedByChannelAssignment" dt:type="boolean"/>
    <AttributeType name="simulationBit" dt:type="ui4"/>
    <AttributeType name="statusChannel" dt:type="boolean"/>
    <AttributeType name="substituteValueBit" dt:type="ui4"/>
    <AttributeType name="slotNumber" dt:type="ui1"/>
    <!--Definition of Elements-->
    <ElementType name="DpAddress" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="bitPosition" required="yes"/>
        <attribute type="bitLength" required="yes"/>
    </ElementType>
    <ElementType name="DpV1Address" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="api" required="yes"/>
        <attribute type="slotNumber" required="yes"/>
        <attribute type="index" required="yes"/>
        <attribute type="bitPosition" required="no"/>
        <attribute type="bitLength" required="no"/>
    </ElementType>
    <ElementType name="StatusInformation" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="logic" required="yes"/>
        <attribute type="invalidBit" required="no"/>
        <attribute type="simulationBit" required="no"/>
        <attribute type="substituteValueBit" required="no"/>
    </ElementType>
    <ElementType name="FDTChannel" content="eltOnly" model="closed" order="seq">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="fdt:tag" required="yes"/>
        <attribute type="fdt:id" required="yes"/>
        <attribute type="fdt:descriptor" required="no"/>
        <attribute type="protectedByChannelAssignment" required="yes"/>
        <attribute type="number" required="yes"/>
        <attribute type="fdt:dataType" required="yes"/>
        <attribute type="fdt:signalType" required="yes"/>
        <attribute type="frameApplicationTag" required="no"/>
        <attribute type="appId:applicationId" required="no"/>
        <element type="fdt:SemanticInformation" minOccurs="0" maxOccurs="*"/>
        <element type="fdt:BitEnumeratorEntries" minOccurs="0" maxOccurs="1"/>
        <element type="fdt:EnumeratorEntries" minOccurs="0" maxOccurs="1"/>
```

```
        <element type="fdt:Unit" minOccurs="0" maxOccurs="1"/>
        <element type="DpAddress" minOccurs="0" maxOccurs="1"/>
        <element type="DpV1Address" minOccurs="0" maxOccurs="1"/>
        <element type="StatusInformation" minOccurs="0" maxOccurs="1"/>
        <element type="fdt:Alarms" minOccurs="0" maxOccurs="1"/>
        <element type="fdt:Ranges" minOccurs="0" maxOccurs="1"/>
        <element type="fdt:Deadband" minOccurs="0" maxOccurs="1"/>
        <element type="fdt:SubstituteValue" minOccurs="0" maxOccurs="1"/>
        <element type="fdt:StructuredElements" minOccurs="0" maxOccurs="1"/>  <!--should be used if the data type is
structured-->
    </ElementType>
    <ElementType name="FDTChannelType" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <element type="fdt:VersionInformation" minOccurs="1" maxOccurs="1"/>
        <attribute type="gatewayBusCategory" required="no"/>
        <attribute type="statusChannel" required="no"/>
    </ElementType>
    <ElementType name="FDT" content="eltOnly" model="closed">
        <attribute type="schemaVersion" required="no"/>
        <attribute type="fdt:nodeId" required="no"/>
        <element type="FDTChannelType" minOccurs="1" maxOccurs="1"/>
        <element type="FDTChannel" minOccurs="1" maxOccurs="1"/>
    </ElementType>
</Schema>
```

EXAMPLE:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTProfibusChannelParameterSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <FDTChannelType>
        <fdt:VersionInformation name="myname" vendor="myVendor" version="1.0" date="2000-08-05"/>
    </FDTChannelType>
    <FDTChannel fdt:tag="myTag" fdt:id="PV" protectedByChannelAssignment="0" number="123" fdt:dataType="float"
                fdt:signalType="output">
        <DpAddress bitPosition="17" bitLength="32"/>
        <DpV1Address api="1" slotNumber="1" index="1" bitPosition="0" bitLength="32"/>
        <StatusInformation logic="positive"/>
        <fdt:Alarms>
            <fdt:Alarm alarmType="lowAlarm">
                <fdt:StaticValue staticValue="25"/>
            </fdt:Alarm>
            <fdt:Alarm alarmType="highAlarm">
                <fdt:StaticValue staticValue="100"/>
            </fdt:Alarm>
        </fdt:Alarms>
        <fdt:Ranges>
            <fdt:Range>
                <fdt:LowerRange>
                    <fdt:ChannelReference idref="PV_LOWER_RANGE_VALUE"/>
                </fdt:LowerRange>
                <fdt:UpperRange>
                    <fdt:ChannelReference idref="PV_UPPER_RANGE_VALUE"/>
                </fdt:UpperRange>
                <fdt:Unit>
                    <fdt:ChannelReference idref="PV_RANGE_VALUES_UNITS_CODE"/>
                </fdt:Unit>
            </fdt:Range>
        </fdt:Ranges>
    </FDTChannel>
</FDT>
```


11 Device identification

11.1 Device type identification data types – FDTProfibusIdentSchema

The definition of the attributes and elements follows the data type definition as defined in IEC 62453-303-1.

```
<Schema name="FDTProfibusIdentSchema" xmlns="urn:schemas-microsoft-com:xml-data" xmlns:dt="urn:schemas-microsoft-
com:datatypes">
    <!--Definition of Attributes-->
    <AttributeType name="schemaVersion" dt:type="number" default="1.21"/>
    <AttributeType name="busProtocol" dt:type="enumeration" dt:values="protocol_DP protocol_IM  protocol_PA"/>
```

```
    <!--                                -->
    <!--            DP                  -->
    <AttributeType name="slaveAddress" dt:type="ui1"/>
    <!-- data source: live list provided by Profibus master - display decimal format -->
    <AttributeType name="identNumber" dt:type="bin.hex"/>
    <!-- Profile IDENT_NUMBER: 0x9700 ( 0x9700 to 0x9742) or Manufacturer specific IDENT_NUMBER -->
    <!-- Display format: 0xabcd -->
    <!--                                -->
    <!--            IM                  -->
    <AttributeType name="manufacturer_id" dt:type="ui2"/>
    <!--  I&M 0 Element 1Mapped to  PB.DEVICE_MAN_ID -->
    <AttributeType name="order_id" dt:type="string" dt:maxLength="20"/>
    <!--  I&M 0 Element 2 Mapped to PB.DEVICE_ID -->
    <AttributeType name="serialNumber" dt:type="string" dt:maxLength="16"/>
    <!--  I&M 0 Element 3 unique serial number - Mapped to PB.DEVICE_SER_NUM -->
    <AttributeType name="hardwareRevision" dt:type="string"/>
    <!-- I&M 0 Element 4 HARDWARE_REVISION - 2 Octets transformed  to string (to be consistent to PA_I&M) -->
    <!-- if PROFILE_ID is 0x9700 = device is PA device, HARDWARE_REVISION must be read from PA_I&M0 element 2 -->
    <AttributeType name="softwareRevision" dt:type="string"/>
    <!-- I&M 0 Element 5 SOFTWARE_REVISION - 4 Octets: 4 Octets – 1 char + 3 unsigned 8 , e.g.: V1.2.3 -->
    <!-- if PROFILE_ID is 0x9700 = device is PA device, SOFTWARE_REVISION must be read from PA_I&M0 element 3 -->
    <AttributeType name="profileID" dt:type="ui2"/>
    <!--I&M 0 Element 7  PROFILE_ID -->
    <AttributeType name="profileSpecificType" dt:type="ui2"/>
    <!--  I&M 0 Element 8 PROFILE_SPECIFIC_TYPE -  MSB = BLOCK_OBJECT, LSB = PARENT_CLASS -->
    <AttributeType name="imVersion" dt:type="float"/>
    <!--  I&M 0 Element 9 IM_VERSION - 2 Octets – unsigned 16; MSB major version xxx, LSB minor version yyy - convert to
float xxx.yyy -->
    <!-- Frame Application and DTMs should split the float to major version and minor version for display -->
    <AttributeType name="imSupported" dt:type="ui2"/>
    <!--  I&M 0 Element 10 IM_SUPPORTED -->
    <AttributeType name="tagFunction" dt:type="string" dt:maxLength="32"/>
    <!-- I&M1 element 1 TAG_FUNCTION - mapped to semantic of IdTag -->
    <AttributeType name="tagLocation" dt:type="string" dt:maxLength="22"/>
    <!--  I&M1 element 2 TAG_LOCATION -->
    <!--                                -->
    <!--            PA                  -->
    <!-- AttributeType name="profile" dt:type="enumeration" dt:values="DP PA IM"/ -->
    <AttributeType name="profilePA" dt:type="ui2"/>
    <!-- Block structure of physical block - element 7:  OctetString - (Index 10 - size 2)  -->
    <AttributeType name="profileRevisionPA" dt:type="ui2"/>
    <!-- Block structure of physical block – element 6: Unsigned 16 - (Index 6)  -->
    <AttributeType name="device_man_id" dt:type="ui2"/>
    <!-- DEVICE_MAN_ID Physical Block - Index 10 - display format: decimal-->
    <AttributeType name="device_id" dt:type="string" dt:maxLength="16"/>
    <!-- DEVICE_ID´Physical Block - Index 11 - VisibleString 16  -->
    <AttributeType name="softwareRevisionPA" dt:type="string" dt:maxLength="16"/>
    <!-- SOFTWARE_REVISION Physical Block - Index 8 (VisibleString 16)  -->
    <AttributeType name="hardwareRevisionPA" dt:type="string" dt:maxLength="16"/>
    <!-- HARDWARE_REVISION Physical Block - Index 9 (VisibleString 16)  -->
    <!-- reused from I&M:
    <AttributeType name="serialNumber" dt:type="string" dt:maxLength="16"/>
         DEVICE_SER_Num Physical Block - Index 12 (VisibleString 16)
    -->
    <AttributeType name="deviceTAG" dt:type="string" dt:maxLength="16"/>
    <!-- TAG_DESC BO of PB - OctetString 32 -->
    <AttributeType name="profileSpecificTypePA" dt:type="ui2"/>
    <!-- block object PARENT_CLASS of first TransducerBlock -->
    <!--                                -->
    <!--            general             -->
    <AttributeType name="idDTMSupportLevel" dt:type="enumeration" dt:values="genericSupport profileSupport
blockspecificProfileSupport specificSupport identSupport"/>
    <AttributeType name="manufacturerSpecificExtension" dt:type="string"/>
    <AttributeType name="match" dt:type="string"/>
    <AttributeType name="nomatch" dt:type="string"/>
    <ElementType name="RegExpr" content="empty" model="closed">
        <attribute type="match" required="no"/>
        <attribute type="nomatch" required="no"/>
    </ElementType>
</Schema>
```


11.2 Topology scan data types – DTMProfibusDeviceSchema

Used at IDtmEvents::OnScanResponse()

The XML document describes one entry in the list of scanned PROFIBUS-Devices. The definition of the attributes and elements follows the data type definition as defined in IEC 62453-303-1.

```
<Schema name="DTMProfibusDeviceSchema" xmlns="urn:schemas-microsoft-com:xml-data" xmlns:fdt="x-
schema:FDTDataTypesSchema.xml" xmlns:dt="urn:schemas-microsoft-com:datatypes">
    <!--Definition of Attributes-->
    <AttributeType name="schemaVersion" dt:type="number" default="1.21"/>
    <AttributeType name="busAddress" dt:type="ui1"/>
    <!--Definition of Elements-->
    <ElementType name="ProfibusDevice" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="schemaVersion" required="no"/>
        <attribute type="busAddress" required="yes"/>
        <attribute type="fdt:deviceTypeId" required="yes"/>
        <attribute type="fdt:subDeviceType" required="no"/>
    </ElementType>
</Schema>
```

11.3 Scan identification data types – FDTProfibusScanIdentSchema

This schema defines the XML document provided by a scan response of a Profibus fieldbus. The definition of the attributes and elements follows the data type definition as defined in IEC 62453-303-1.

```
<Schema name="FDTProfibusScanIdentSchema" xmlns="urn:schemas-microsoft-com:xml-data" xmlns:dt="urn:schemas-
microsoft-com:datatypes" xmlns:profibusident="x-schema:FDTProfibusIdentSchema.xml" xmlns:fdt="x-
schema:FDTDataTypesSchema.xml">
    <!--Definition of Attributes-->
    <AttributeType name="schemaVersion" dt:type="number" default="1.21"/>
    <AttributeType name="resultState" dt:type="enumeration" dt:values="provisional final error"/>
    <AttributeType name="configuredState" dt:type="enumeration" dt:values="configuredAndPhysicallyAvailable
configuredAndNotPhysicallyAvailable availableButNotConfigured notApplicable"/>
    <!--Definition of elements-->
    <ElementType name="IdAddress" content="empty" model="closed">
        <attribute type="profibusident:slaveAddress" required="yes"/>
    </ElementType>
    <ElementType name="IdBusProtocol" content="empty" model="closed">
        <attribute type="profibusident:busProtocol" required="yes"/>
    </ElementType>
    <ElementType name="IdTypeID" content="empty" model="closed">
        <attribute type="profibusident:identNumber" required="yes"/>
    </ElementType>
    <!--                                    -->
    <!--              IM                    -->
    <!--                                    -->
    <ElementType name="Manufacturer_id" content="empty" model="closed">
        <attribute type="profibusident:manufacturer_id" required="yes"/>
    </ElementType>
    <ElementType name="Order_id" content="empty" model="closed">
        <attribute type="profibusident:order_id" required="yes"/>
    </ElementType>
    <ElementType name="IdSerialNumber" content="empty" model="closed">
        <attribute type="profibusident:serialNumber" required="yes"/>
    </ElementType>
    <ElementType name="IdHardwareRevision" content="empty" model="closed">
        <attribute type="profibusident:hardwareRevision" required="yes"/>
    </ElementType>
    <ElementType name="IdSoftwareRevision" content="empty" model="closed">
        <attribute type="profibusident:softwareRevision" required="yes"/>
    </ElementType>
    <ElementType name="IdTag" content="empty" model="closed">
        <attribute type="profibusident:deviceTAG" required="yes"/>
    </ElementType>
    <ElementType name="ProfileID" content="empty" model="closed">
        <attribute type="profibusident:profileID" required="yes"/>
    </ElementType>
    <ElementType name="ProfileSpecificType" content="empty" model="closed">
        <attribute type="profibusident:profileSpecificType" required="yes"/>
    </ElementType>
    <ElementType name="ImVersion" content="empty" model="closed">
        <attribute type="profibusident:imVersion" required="yes"/>
    </ElementType>
    <ElementType name="TagFunction" content="empty" model="closed">
```

```
    <attribute type="profibusident:tagFunction" required="yes"/>
</ElementType>
<ElementType name="TagLocation" content="empty" model="closed">
    <attribute type="profibusident:tagLocation" required="yes"/>
</ElementType>
<ElementType name="ImSupported" content="empty" model="closed">
    <attribute type="profibusident:imSupported" required="yes"/>
</ElementType>
<!--            -->
<!--  PA     -->
<!--                -->
<ElementType name="IdSoftwareRevisionPA" content="empty" model="closed">
    <attribute type="profibusident:softwareRevisionPA" required="yes"/>
</ElementType>
<ElementType name="IdHardwareRevisionPA" content="empty" model="closed">
    <attribute type="profibusident:hardwareRevisionPA" required="yes"/>
</ElementType>
<ElementType name="ProfileRevisionPA" content="empty" model="closed">
    <attribute type="profibusident:profileRevisionPA" required="yes"/>
</ElementType>
<ElementType name="Device_man_id" content="empty" model="closed">
    <attribute type="profibusident:device_man_id" required="yes"/>
</ElementType>
<ElementType name="Device_id" content="empty" model="closed">
    <attribute type="profibusident:device_id" required="yes"/>
</ElementType>
<ElementType name="ProfileSpecificTypePA" content="empty" model="closed">
    <attribute type="profibusident:profileSpecificTypePA" required="yes"/>
</ElementType>
<!-- reuse element from I&M
<ElementType name="IdSerialNumber" content="empty" model="closed">
    <attribute type="profibusident:serialNumber" required="yes"/>
</ElementType>
<ElementType name="IdTag" content="empty" model="closed">
    <attribute type="profibusident:deviceTAG" required="yes"/>
</ElementType>
-->
<!--            -->
<ElementType name="ManufacturerSpecificExtension" content="empty" model="closed">
    <attribute type="profibusident:manufacturerSpecificExtension" required="yes"/>
</ElementType>
<ElementType name="ScanIdentification_DP" content="eltOnly" model="closed">
    <attribute type="configuredState" required="no"/>
    <!--   attributes with semantic meaning: -->
    <element type="fdt:CommunicationError" minOccurs="0" maxOccurs="1"/>
    <element type="IdAddress" minOccurs="1" maxOccurs="1"/>
    <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <!--   manufacturer specific extension, added in manufacturer specific identification -->
    <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
</ElementType>
<ElementType name="ScanIdentification_IM" content="eltOnly" model="closed">
    <attribute type="configuredState" required="no"/>
    <!--   attributes with semantic meaning: -->
    <element type="fdt:CommunicationError" minOccurs="0" maxOccurs="1"/>
    <element type="IdAddress" minOccurs="1" maxOccurs="1"/>
    <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <element type="Manufacturer_id" minOccurs="1" maxOccurs="1"/>
    <element type="Order_id" minOccurs="1" maxOccurs="1"/>
    <element type="IdHardwareRevision" minOccurs="1" maxOccurs="1"/>
    <element type="IdSoftwareRevision" minOccurs="1" maxOccurs="1"/>
    <element type="ProfileID" minOccurs="1" maxOccurs="1"/>
    <element type="ProfileSpecificType" minOccurs="1" maxOccurs="1"/>
    <element type="IdSerialNumber" minOccurs="1" maxOccurs="1"/>
    <element type="ImVersion" minOccurs="1" maxOccurs="1"/>
    <element type="TagFunction" minOccurs="1" maxOccurs="1"/>
    <element type="TagLocation" minOccurs="1" maxOccurs="1"/>
    <!-- TagFunction to be transformed to IdTag -->
    <element type="ImSupported" minOccurs="1" maxOccurs="1"/>
    <!--   manufacturer specific extension, added in manufacturer specific identification -->
    <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
</ElementType>
<ElementType name="ScanIdentification_PA" content="eltOnly" model="closed">
    <attribute type="configuredState" required="no"/>
    <!--   attributes with semantic meaning: -->
    <element type="fdt:CommunicationError" minOccurs="0" maxOccurs="1"/>
```

```
        <element type="IdAddress" minOccurs="1" maxOccurs="1"/>
        <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
        <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
        <element type="IdSoftwareRevisionPA" minOccurs="1" maxOccurs="1"/>
        <element type="IdHardwareRevisionPA" minOccurs="1" maxOccurs="1"/>
        <element type="ProfileRevisionPA" minOccurs="1" maxOccurs="1"/>
        <element type="Device_man_id" minOccurs="1" maxOccurs="1"/>
        <element type="Device_id" minOccurs="1" maxOccurs="1"/>
        <element type="ProfileSpecificTypePA" minOccurs="1" maxOccurs="1"/>
        <element type="IdSerialNumber" minOccurs="1" maxOccurs="1"/>
        <element type="IdTag" minOccurs="1" maxOccurs="1"/>
        <!--   manufacturer specific extension, added in manufacturer specific identification -->
        <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
    </ElementType>
    <ElementType name="ScanIdentifications" content="eltOnly" model="closed">
        <attribute type="fdt:busCategory" required="yes"/>
        <attribute type="resultState" required="yes"/>
        <group order="one" minOccurs="1" maxOccurs="*">
            <element type="ScanIdentification_DP" minOccurs="0" maxOccurs="*"/>
            <element type="ScanIdentification_IM" minOccurs="0" maxOccurs="*"/>
            <element type="ScanIdentification_PA" minOccurs="0" maxOccurs="*"/>
        </group>
    </ElementType>
    <ElementType name="FDT" content="eltOnly" model="closed">
        <element type="ScanIdentifications" minOccurs="1" maxOccurs="1"/>
    </ElementType>
</Schema>
```

11.4 Device type identification data types – FDTProfibusDeviceIdentSchema

This clause describes the schema for device type identification. The definition of the attributes and elements follows the data type definition as defined in IEC 62453-303-1.

```
<Schema name="FDTProfibusDeviceIdentSchema" xmlns="urn:schemas-microsoft-com:xml-data" xmlns:dt="urn:schemas-microsoft-com:datatypes" xmlns:profibusident="x-schema:FDTProfibusIdentSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml">
    <!--Definition of Attributes-->
    <AttributeType name="schemaVersion" dt:type="number" default="1.21"/>
    <ElementType name="IdBusProtocol" content="eltOnly" model="closed">
        <attribute type="profibusident:busProtocol" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <ElementType name="IdTypeID" content="eltOnly" model="closed">
        <attribute type="profibusident:identNumber" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <!--          -->
    <!--  IM      -->
    <!--          -->
    <ElementType name="Manufacturer_id" content="eltOnly" model="closed">
        <attribute type="profibusident:manufacturer_id" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <ElementType name="Order_id" content="eltOnly" model="closed">
        <attribute type="profibusident:order_id" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <ElementType name="IdHardwareRevision" content="eltOnly" model="closed">
        <attribute type="profibusident:hardwareRevision" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <ElementType name="IdSoftwareRevision" content="eltOnly" model="closed">
        <attribute type="profibusident:softwareRevision" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <ElementType name="ProfileID" content="eltOnly" model="closed">
        <attribute type="profibusident:profileID" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <ElementType name="ProfileSpecificType" content="eltOnly" model="closed">
        <attribute type="profibusident:profileSpecificType" required="no"/>
        <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
    </ElementType>
    <ElementType name="ImVersion" content="eltOnly" model="closed">
        <attribute type="profibusident:imVersion" required="no"/>
```

```
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<ElementType name="ImSupported" content="eltOnly" model="closed">
    <attribute type="profibusident:imSupported" required="no"/>
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<!--              -->
<!--  PA     -->
<!--                 -->
<ElementType name="IdSoftwareRevisionPA" content="eltOnly" model="closed">
    <attribute type="profibusident:softwareRevisionPA" required="no"/>
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<ElementType name="IdHardwareRevisionPA" content="eltOnly" model="closed">
    <attribute type="profibusident:hardwareRevisionPA" required="no"/>
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<ElementType name="ProfileRevisionPA" content="eltOnly" model="closed">
    <attribute type="profibusident:profileRevisionPA" required="no"/>
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<ElementType name="Device_man_id" content="eltOnly" model="closed">
    <attribute type="profibusident:device_man_id" required="no"/>
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<ElementType name="Device_id" content="eltOnly" model="closed">
    <attribute type="profibusident:device_id" required="no"/>
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<ElementType name="ProfileSpecificTypePA" content="eltOnly" model="closed">
    <attribute type="profibusident:profileSpecificTypePA" required="no"/>
    <element type="profibusident:RegExpr" minOccurs="0" maxOccurs="*"/>
</ElementType>
<!-- -->
<!-- -->
<!-- -->
<ElementType name="ManufacturerSpecificExtension" content="empty" model="closed">
    <attribute type="profibusident:manufacturerSpecificExtension" required="yes"/>
</ElementType>
<ElementType name="DeviceIdentification_DP" content="eltOnly" model="closed">
    <attribute type="profibusident:idDTMSupportLevel" required="yes"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
    <!--   manufacturer specific extension, added in manufacturer specific identification -->
    <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
</ElementType>
<ElementType name="DeviceIdentification_IM" content="eltOnly" model="closed">
    <attribute type="profibusident:idDTMSupportLevel" required="yes"/>
    <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <element type="Manufacturer_id" minOccurs="1" maxOccurs="1"/>
    <element type="Order_id" minOccurs="1" maxOccurs="1"/>
    <element type="IdHardwareRevision" minOccurs="1" maxOccurs="1"/>
    <element type="IdSoftwareRevision" minOccurs="1" maxOccurs="1"/>
    <element type="ProfileID" minOccurs="1" maxOccurs="1"/>
    <element type="ProfileSpecificType" minOccurs="1" maxOccurs="1"/>
    <element type="ImVersion" minOccurs="1" maxOccurs="1"/>
    <element type="ImSupported" minOccurs="1" maxOccurs="1"/>
    <!--   manufacturer specific extension, added in manufacturer specific identification -->
    <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
</ElementType>
<ElementType name="DeviceIdentification_PA" content="eltOnly" model="closed">
    <attribute type="profibusident:idDTMSupportLevel" required="yes"/>
    <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <element type="IdSoftwareRevisionPA" minOccurs="1" maxOccurs="1"/>
    <element type="IdHardwareRevisionPA" minOccurs="1" maxOccurs="1"/>
    <element type="ProfileRevisionPA" minOccurs="1" maxOccurs="1"/>
    <element type="Device_man_id" minOccurs="1" maxOccurs="1"/>
    <element type="Device_id" minOccurs="1" maxOccurs="1"/>
    <element type="ProfileSpecificTypePA" minOccurs="1" maxOccurs="1"/>
    <!--   manufacturer specific extension, added in manufacturer specific identification -->
    <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
</ElementType>
<ElementType name="DeviceIdentifications" content="eltOnly" model="closed">
    <attribute type="fdt:busCategory" required="yes"/>
    <group order="one" minOccurs="1" maxOccurs="*">
```

```
            <element type="DeviceIdentification_DP" minOccurs="0" maxOccurs="*"/>
            <element type="DeviceIdentification_IM" minOccurs="0" maxOccurs="*"/>
            <element type="DeviceIdentification_PA" minOccurs="0" maxOccurs="*"/>
        </group>
    </ElementType>
    <ElementType name="FDT" content="eltOnly" model="closed">
        <element type="DeviceIdentifications" minOccurs="1" maxOccurs="1"/>
    </ElementType>
</Schema>
```

11.5 XSLT Transformation

```
<?xml version="1.0" encoding="UTF-8"?>

<!--
FDT: device identification transformation for Profibus device identification xml files
-->
<xsl:transform  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
        xmlns:str="http://xsltsl.org/string"
        xmlns:ident="x-schema:DTMIdentSchema.xml"
        xmlns:fdt="x-schema:FDTDataTypesSchema.xml"
        xmlns:scanident="x-schema:DTMScanIdentSchema.xml"
        xmlns:devident="x-schema:DTMDeviceTypeIdentSchema.xml"
        xmlns:pbident="x-schema:FDTProfibusIdentSchema.xml"
        xmlns:pbdevice="x-schema:FDTProfibusDeviceTypeIdentSchema.xml"
        xmlns:pbscan="x-schema:FDTProfibusScanIdentSchema.xml" version="2.0">
        <!--
FDT: version of this file
    -->

    <xsl:variable name="FileVersion">
        <xsl:number value="1.21"/>
    </xsl:variable>
    <xsl:output method="xml" omit-xml-declaration="yes" indent="yes"/>
<!--
root: transform device or scan identification
-->
    <xsl:template match="/">
            <xsl:apply-templates select="//pbscan:ScanIdentifications"/>
            <xsl:apply-templates select="//pbdevice:DeviceIdentifications"/>
    </xsl:template>
<!--
profibus identification list
-->
    <xsl:template match="pbdevice:DeviceIdentifications">
        <xsl:text disable-output-escaping="yes">&lt;?xml version="1.0"?&gt;
    &lt;!-- This file is created by FDTxxxIdentTransformation.xsl after transformation of xxxDTMDeviceIdentificationInstance.xml
--&gt;
    &lt;FDT xmlns="x-schema:DTMDeviceTypeIdentSchema.xml"
     xmlns:ident="x-schema:DTMIdentSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml" &gt;</xsl:text>
            <xsl:element name="DeviceIdentifications">
                <xsl:apply-templates select="pbdevice:DeviceIdentification_DP"/>
                <xsl:apply-templates select="pbdevice:DeviceIdentification_IM"/>
                <xsl:apply-templates select="pbdevice:DeviceIdentification_PA"/>
            </xsl:element>
        <xsl:text disable-output-escaping="yes">&lt;/FDT&gt;</xsl:text>
    </xsl:template>
<!--
profibus DP catalog identifcation
-->
    <xsl:template match="pbdevice:DeviceIdentification_DP">
            <xsl:element name="DeviceIdentification">
                <xsl:attribute name="ident:idDTMSupportLevel">
                    <xsl:value-of select="@pbident:idDTMSupportLevel"/>
                </xsl:attribute>
                <xsl:element name="IdBusProtocol">
                    <xsl:attribute name="ident:protocolSpecificName">Profibus DP</xsl:attribute>
                    <xsl:attribute name="ident:value">
                        <xsl:value-of select="pbdevice:IdBusProtocol/@pbident:busProtocol"/>
                    </xsl:attribute>
                </xsl:element>
                <xsl:element name="IdBusProtocolVersion">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
```

```
                <xsl:element name="IdManufacturer">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbdevice:IdTypeID"/>
                <xsl:element name="IdSoftwareRevision" >
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdHardwareRevision" >
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdValues">
                    <xsl:apply-templates select="pbdevice:ManufacturerSpecificExtension"/>
                </xsl:element>
            </xsl:element>
    </xsl:template>
<!--
DP scan identifcation
-->
    <xsl:template match="pbscan:ScanIdentification_DP">
            <xsl:element name="ScanIdentification">
                <xsl:apply-templates select="@configuredState" />
                <xsl:apply-templates select="fdt:CommunicationError"/>
                <xsl:element name="IdBusProtocol">
                    <xsl:attribute name="ident:protocolSpecificName">Profibus DP</xsl:attribute>
                    <xsl:attribute name="ident:value">
                        <xsl:value-of select="pbscan:IdBusProtocol/@pbident:busProtocol"/>
                    </xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbscan:IdBusProtocol"/>
                <xsl:element name="IdBusProtocolVersion">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbscan:IdAddress"/>
                <xsl:element name="IdManufacturer">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbscan:IdTypeID"/>
                <xsl:element name="IdSoftwareRevision" >
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdHardwareRevision" >
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdDeviceTag">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdSerialNumber">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdValues">
                    <xsl:apply-templates select="pbscan:ManufacturerSpecificExtension"/>
                </xsl:element>
            </xsl:element>
    </xsl:template>
<!--
profibus IM catalog identifcation
-->
    <xsl:template match="pbdevice:DeviceIdentification_IM">
            <xsl:element name="DeviceIdentification">
                <xsl:attribute name="ident:idDTMSupportLevel">
                    <xsl:value-of select="@pbident:idDTMSupportLevel"/>
                </xsl:attribute>
                <xsl:element name="IdBusProtocol">
                    <xsl:attribute name="ident:protocolSpecificName">Profibus IM</xsl:attribute>
                    <xsl:attribute name="ident:value">
                        <xsl:value-of select="pbdevice:IdBusProtocol/@pbident:busProtocol"/>
                    </xsl:attribute>
                </xsl:element>
                <xsl:element name="IdBusProtocolVersion">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbdevice:Manufacturer_id"/>
                <xsl:apply-templates select="pbdevice:IdTypeID"/>
                <xsl:apply-templates select="pbdevice:IdSoftwareRevision"/>
                <xsl:apply-templates select="pbdevice:IdHardwareRevision"/>
                <xsl:element name="IdValues">
                    <xsl:apply-templates select="pbdevice:order_id"/>
```

```
                    <xsl:apply-templates select="pbdevice:ProfileID"/>
                    <xsl:apply-templates select="pbdevice:ImVersion"/>
                    <xsl:apply-templates select="pbdevice:ProfileSpecificType"/>
                    <xsl:apply-templates select="pbdevice:ImSupported"/>
                    <xsl:apply-templates select="pbdevice:ManufacturerSpecificExtension"/>
                </xsl:element>
            </xsl:element>
    </xsl:template>
<!--
profibus IM scan identifcation
-->
    <xsl:template match="pbscan:ScanIdentification_IM">
            <xsl:element name="ScanIdentification">
                <xsl:apply-templates select="@configuredState" />
                <xsl:apply-templates select="fdt:CommunicationError"/>
                <xsl:element name="IdBusProtocol">
                    <xsl:attribute name="ident:protocolSpecificName">Profibus IM</xsl:attribute>
                    <xsl:attribute name="ident:value">
                        <xsl:value-of select="pbscan:IdBusProtocol/@pbident:busProtocol"/>
                    </xsl:attribute>
                </xsl:element>
                <xsl:element name="IdBusProtocolVersion">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbscan:IdAddress"/>
                <xsl:apply-templates select="pbscan:Manufacturer_id"/>
                <xsl:apply-templates select="pbscan:IdTypeID"/>
                <xsl:apply-templates select="pbscan:IdSoftwareRevision"/>
                <xsl:apply-templates select="pbscan:IdHardwareRevision"/>
                <xsl:element name="IdDeviceTag">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdSerialNumber">
                    <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
                </xsl:element>
                <xsl:element name="IdValues">
                    <xsl:apply-templates select="pbscan:order_id"/>
                    <xsl:apply-templates select="pbscan:ProfileID"/>
                    <xsl:apply-templates select="pbscan:ImVersion"/>
                    <xsl:apply-templates select="pbscan:ProfileSpecificType"/>
                    <xsl:apply-templates select="pbscan:ImSupported"/>
                    <xsl:apply-templates select="pbscan:ManufacturerSpecificExtension"/>
                </xsl:element>
            </xsl:element>
    </xsl:template>

<!--
profibus PA catalog identifcation
-->
    <xsl:template match="pbdevice:DeviceIdentification_PA">
            <xsl:element name="DeviceIdentification">
                <xsl:attribute name="ident:idDTMSupportLevel">
                    <xsl:value-of select="@pbident:idDTMSupportLevel"/>
                </xsl:attribute>
                <xsl:element name="IdBusProtocol">
                    <xsl:attribute name="ident:protocolSpecificName">Profile</xsl:attribute>
                    <xsl:attribute name="ident:value">
                        <xsl:value-of select="pbdevice:IdBusProtocol/@pbident:busProtocol"/>
                    </xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbdevice:ProfileRevisionPA"/>
                <xsl:apply-templates select="pbdevice:Device_man_id"/>
                <xsl:apply-templates select="pbdevice:IdTypeID"/>
                <xsl:apply-templates select="pbdevice:IdSoftwareRevisionPA"/>
                <xsl:apply-templates select="pbdevice:IdHardwareRevisionPA"/>
                <xsl:element name="IdValues">
                    <xsl:apply-templates select="pbdevice:Device_id"/>
                    <xsl:apply-templates select="pbdevice:ProfileSpecificTypePA"/>
                    <xsl:apply-templates select="pbdevice:ManufacturerSpecificExtension"/>
                </xsl:element>
            </xsl:element>
    </xsl:template>
<!--
profibus PA scan identifcation
-->
    <xsl:template match="pbscan:ScanIdentification_PA">
            <xsl:element name="ScanIdentification">
```

```
                <xsl:apply-templates select="@configuredState" />
                <xsl:apply-templates select="fdt:CommunicationError"/>
                <xsl:element name="IdBusProtocol">
                    <xsl:attribute name="ident:protocolSpecificName">Profile</xsl:attribute>
                    <xsl:attribute name="ident:value">
                        <xsl:value-of select="pbscan:IdBusProtocol/@pbident:busProtocol"/>
                    </xsl:attribute>
                </xsl:element>
                <xsl:apply-templates select="pbscan:ProfileRevisionPA"/>
                <xsl:apply-templates select="pbscan:IdAddress"/>
                <xsl:apply-templates select="pbscan:Device_man_id"/>
                <xsl:apply-templates select="pbscan:IdTypeID"/>
                <xsl:apply-templates select="pbscan:IdSoftwareRevisionPA"/>
                <xsl:apply-templates select="pbscan:IdHardwareRevisionPA"/>
                <xsl:apply-templates select="pbscan:IdTag"/>
                <xsl:apply-templates select="pbscan:IdSerialNumber"/>
                <xsl:element name="IdValues">
                    <xsl:apply-templates select="pbscan:Device_id"/>
                    <xsl:apply-templates select="pbscan:ProfileSpecificTypePA"/>
                    <xsl:apply-templates select="pbscan:ManufacturerSpecificExtension"/>
                </xsl:element>
            </xsl:element>
    </xsl:template>

<!--
scan list
-->
    <xsl:template match="pbscan:ScanIdentifications">
            <xsl:text disable-output-escaping="yes">&lt;?xml version="1.0"?&gt;
    &lt;!-- This file is created by FDTxxxIdentTransformation.xsl after transformation of xxxDTMScanIdentificationInstance.xml --
&gt;&lt;FDT xmlns="x-schema:DTMScanIdentSchema.xml"
     xmlns:ident="x-schema:DTMIdentSchema.xml" xmlns:fdt="x-schema:FDTDataTypesSchema.xml" &gt;</xsl:text>
                <xsl:element name="ScanIdentifications">
                    <xsl:attribute name="fdt:busCategory">
                        <xsl:value-of select="@fdt:busCategory"/>
                    </xsl:attribute>
                    <xsl:attribute name="resultState">
                        <xsl:value-of select="@resultState"/>
                    </xsl:attribute>
                    <xsl:apply-templates select="pbscan:ScanIdentification_DP"/>
                    <xsl:apply-templates select="pbscan:ScanIdentification_IM"/>
                    <xsl:apply-templates select="pbscan:ScanIdentification_PA"/>
                </xsl:element>
        <xsl:text disable-output-escaping="yes">&lt;/FDT&gt;</xsl:text>
    </xsl:template>

<!--
configured attribute
-->
    <xsl:template match="@configuredState">
        <xsl:attribute name="configuredState">
            <xsl:value-of select="."/>
        </xsl:attribute>
    </xsl:template>

<!--
device tag
-->
    <xsl:template match="pbscan:IdTag">
        <xsl:element name="IdDeviceTag">
            <xsl:attribute name="ident:value"><xsl:value-of select="@pbident:deviceTAG"/></xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">TAG_DESC</xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
communicationError
-->
    <xsl:template match="fdt:CommunicationError">
        <xsl:element name="fdt:CommunicationError">
            <xsl:attribute name="communicationError"><xsl:value-of select="@communicationError"/></xsl:attribute>
            <xsl:attribute name="tag"><xsl:value-of select="@tag"/></xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
serialnumber
-->
    <xsl:template match="pbscan:IdSerialNumber">
```

```
        <xsl:element name="IdSerialNumber">
            <xsl:attribute name="ident:value"><xsl:value-of select="@pbident:serialNumber"/></xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">DEVICE_SER_NUM</xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
busaddress
-->
    <xsl:template match="pbscan:IdAddress">
        <xsl:element name="IdAddress">
            <xsl:attribute name="ident:value"><xsl:value-of select="@pbident:slaveAddress"/></xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">Slave Address</xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
Device_id, saved as protocol specific value
-->
    <xsl:template match="pbdevice:Device_id">
        <xsl:param name="value" select="@pbident:device_id"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:name">DEVICE_ID</xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">DEVICE_ID</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:Device_id">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">DEVICE_ID</xsl:attribute>
            <xsl:attribute name="ident:name">DEVICE_ID</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:device_id"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
DeviceType, saved as protocol specific value
-->
    <xsl:template match="pbdevice:DeviceType">
        <xsl:param name="value" select="@pbident:devicetype"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">IDENT_NUMBER</xsl:attribute>
            <xsl:attribute name="ident:name">IDENT_NUMBER</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:DeviceType">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">IDENT_NUMBER</xsl:attribute>
            <xsl:attribute name="ident:name">IDENT_NUMBER</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:devicetype"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
YearOfFirmware, saved as protocol specific value
-->
    <xsl:template match="pbdevice:YearOfFirmware">
        <xsl:param name="value" select="@pbident:yearOfFirmware"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Date of Firmware (Year)</xsl:attribute>
            <xsl:attribute name="ident:name">YearOfFirmware</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:YearOfFirmware">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Date of Firmware (Year)</xsl:attribute>
            <xsl:attribute name="ident:name">YearOfFirmware</xsl:attribute>
```

```
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:yearOfFirmware"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
ProfileRevisionPA
-->
    <xsl:template match="pbdevice:ProfileRevisionPA">
        <xsl:param name="manid" select="@pbident:profileRevisionPA"/>
        <xsl:element name="IdBusProtocolVersion">
            <xsl:attribute name="ident:protocolSpecificName">Profile Revision</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$manid"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:ProfileRevisionPA">
        <xsl:element name="IdBusProtocolVersion">
            <xsl:attribute name="ident:protocolSpecificName">Profile Revision</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:profileRevisionPA"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
DayMonthOfFirmware, saved as protocol specific value
-->
    <xsl:template match="pbdevice:DayMonthOfFirmware">
        <xsl:param name="value" select="@pbident:dayMonthOfFirmware"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Date of Firmware (Day/Month)</xsl:attribute>
            <xsl:attribute name="ident:name">DayMonthOfFirmware</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:DayMonthOfFirmware">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Date of Firmware (Day/Month)</xsl:attribute>
            <xsl:attribute name="ident:name">DayMonthOfFirmware</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:dayMonthOfFirmware"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
ProfileNumber, saved as protocol specific value
-->
    <xsl:template match="pbdevice:ProfileNumber">
        <xsl:param name="value" select="@pbident:profileNumber"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Profile Number</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileNumber</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:ProfileNumber">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Profile Number</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileNumber</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:profileNumber"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
ProfileSpecificTypePA, saved as protocol specific value
-->
    <xsl:template match="pbdevice:ProfileSpecificTypePA">
```

```
        <xsl:param name="value" select="@pbident:profileSpecificTypePA"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">BO PARENT_CLASS</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileSpecificTypePA</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:ProfileSpecificTypePA">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">BO PARENT_CLASS</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileSpecificTypePA</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbscan:profileSpecificTypePA"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
Order_id, saved as protocol specific value
-->
    <xsl:template match="pbdevice:Order_id">
        <xsl:param name="value" select="@pbident:order_id"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">ORDER_ID</xsl:attribute>
            <xsl:attribute name="ident:name">Order_id</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:Order_id">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">ORDER_ID</xsl:attribute>
            <xsl:attribute name="ident:name">Order_id</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:order_id"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
ProfileID, saved as protocol specific value
-->
    <xsl:template match="pbdevice:ProfileID">
        <xsl:param name="value" select="@pbident:profileID"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">PROFILE_ID</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileID</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:ProfileID">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">PROFILE_ID</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileID</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:profileID"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
ProfileSpecificType, saved as protocol specific value
-->
    <xsl:template match="pbdevice:ProfileSpecificType">
        <xsl:param name="value" select="@pbident:profileSpecificType"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">PROFILE_SPECIFIC_TYPE</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileSpecificType</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
```

```
    <xsl:template match="pbscan:ProfileSpecificType">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">PROFILE_SPECIFIC_TYPE</xsl:attribute>
            <xsl:attribute name="ident:name">ProfileSpecificType</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:profileSpecificType"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
ImVersion, saved as protocol specific value
-->
    <xsl:template match="pbdevice:ImVersion">
        <xsl:param name="value" select="@pbident:imVersion"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">IM_VERSION</xsl:attribute>
            <xsl:attribute name="ident:name">ImVersion</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:ImVersion">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">IM_VERSION</xsl:attribute>
            <xsl:attribute name="ident:name">ImVersion</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:imVersion"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
ImSupported, saved as protocol specific value
-->
    <xsl:template match="pbdevice:ImSupported">
        <xsl:param name="value" select="@pbident:imSupported"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">IM_SUPPORTED</xsl:attribute>
            <xsl:attribute name="ident:name">ImSupported</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:ImSupported">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">IM_SUPPORTED</xsl:attribute>
            <xsl:attribute name="ident:name">ImSupported</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:imSupported"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
Manufacturer
-->
<xsl:template match="pbdevice:Manufacturer_id">
        <xsl:param name="manid" select="@pbident:manufacturer_id"/>
        <xsl:element name="IdManufacturer">
            <xsl:attribute name="ident:protocolSpecificName">Manufacturer</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$manid"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="pbscan:Manufacturer_id">
        <xsl:element name="IdManufacturer">
            <xsl:attribute name="ident:protocolSpecificName">Manufacturer</xsl:attribute>
            <xsl:attribute name="ident:value">
                <xsl:value-of select="@pbident:manufacturer_id"/>
            </xsl:attribute>
        </xsl:element>
    </xsl:template>
```