

TECHNICAL REPORT



**Field device tool (FDT) interface specification –
Part 506: Communication implementation for common object model – IEC 61784
CPF 6**



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**Field device tool (FDT) interface specification –
Part 506: Communication implementation for common object model – IEC 61784
CPF 6**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

**Part 506: Communication implementation for common object model –
IEC 61784 CPF 6**

FOREWORD

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IEC/TR 62453-506, which is a technical report, has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation:

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

Each part of the IEC/TR 62453-5xy series is intended to be read in conjunction with its corresponding part in the IEC 62453-3xy series.

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

Enquiry draft	Report on voting
65E/69/DTR	65E/118/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

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

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

INTRODUCTION

This part of IEC 62453 is an interface specification for developers of FDT (Field Device Tool) 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 fieldbusses 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 DTM (Device Type Manager), is supplied by the field device manufacturer with its device. The DTM is integrated into engineering tools via the FDT interfaces defined in this specification. The approach to integration is in general open for all kind of fieldbusses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how IEC/TR 62453-506 is aligned in the structure of IEC 62453 series.

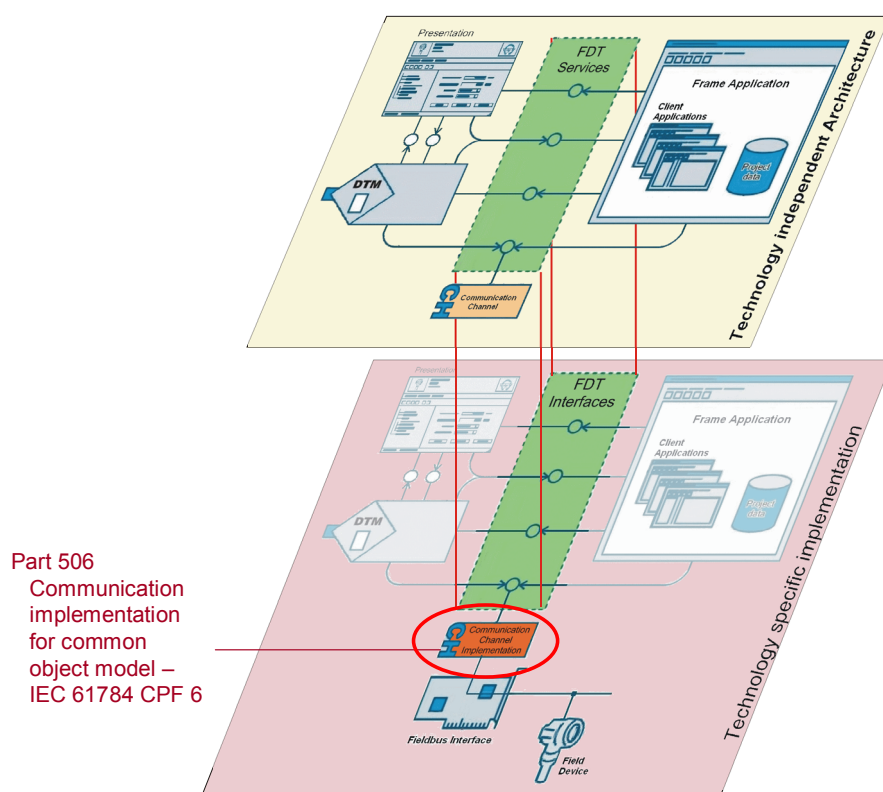


Figure 1 – Part 506 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 506: Communication implementation for common object model – IEC 61784 CPF 6

1 Scope

IEC/TR 62453-506, which is a technical report, provides information for integrating the INTERBUS®¹ technology into the COM based implementation of FDT interface specification (IEC 62453-41).

This part of the IEC 62453 specifies communication and other services.

This specification neither contains the FDT specification nor modifies it.

2 Normative references

The following referenced documents are indispensable for the application of this specification. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies

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

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

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

IEC 62453-306:2009, *Field Device Tool (FDT) interface specification – Part 306: Communication profile integration – IEC 61784 CPF 6*

3 Terms, definitions, symbols, abbreviated terms and conventions

3.1 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 62453-1, IEC 62453-2 and the following apply.

3.2 Symbols and abbreviated terms

For the purpose of this document, the symbols and abbreviations given in IEC 62453-1, IEC 62453-2 apply.

¹ INTERBUS® is the trade name of Phoenix Contact GmbH & Co. KG., control of trade name use is given to the non profit organisation INTERBUS Club. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name INTERBUS. Use of the trade name INTERBUS requires permission of the INTERBUS Club.

3.3 Conventions

3.3.1 Data type names and references to data types

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

3.3.2 Vocabulary for requirements

The following expressions are used when specifying requirements.

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

4 Bus category

IEC 61784 CPF 6 protocol is identified in the attribute busCategory of the BusCategory element by the identifier as specified in IEC 62453-306.

5 Access to instance and device data

Used at methods:

IDtmParameter::GetParameters()

IDtmParameter::SetParameters()

Example:

```
<BusInformation>
  <UserDefinedBus>
    <xdr:Schema name="inlineSchema"
      xmlns:xdr="urn:schemas-microsoft-com:xml-data"
      xmlns:dt="urn:schemas-microsoft-com:datatypes">
      <xdr:AttributeType name="systemNumber" dt:type="ui1"/>
      <xdr:AttributeType name="segmentNumber" dt:type="ui1"/>
      <xdr:AttributeType name="positionNumber" dt:type="ui1"/>
      <xdr:ElementType name="Address" model="closed">
        <xdr:attribute type="systemNumber" required="yes"/>
        <xdr:attribute type="segmentNumber" required="yes"/>
        <xdr:attribute type="positionNumber" required="yes"/>
      </xdr:ElementType>
    </xdr:Schema>
    <interbus:Address xmlns:interbus="x-shema:#inlineSchema"
      systemNumber="1"
      segmentNumber="1"
      positionNumber="0"/>
  </UserDefinedBus>
</BusInformation>
```

6 Protocol specific behavior

IEC 61784 CPF 6 protocol has specific requirements related to <protocol specific behavior>.

7 Protocol specific usage of general data types

Table 1 shows how general data types are used with IEC 61784 CPF 6 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 62453-306.
fdt:protocolId	
fdt:deviceTypeId	
fdt:deviceTypeInfo	
fdt:deviceTypeInfoPath	
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 following methods:

- IDtmParameter:GetParameters
- IDtmParameter:SetParameters

8.2 Interbus Device Address

The address of an Interbus device is provided as contents of an <UserDefinedBus> element.

```

<BusInformation>
  <UserDefinedBus>
    <xdr:Schema name="inlineSchema"
      xmlns:xdr="urn:schemas-microsoft-com:xml-data"
      xmlns:dt="urn:schemas-microsoft-com:datatypes">
      <xdr:AttributeType name="systemNumber" dt:type="ui1"/>
      <xdr:AttributeType name="segmentNumber" dt:type="ui1"/>
      <xdr:AttributeType name="positionNumber" dt:type="ui1"/>
      <xdr:ElementType name="Address" model="closed">
        <xdr:attribute type="systemNumber" required="yes"/>
        <xdr:attribute type="segmentNumber" required="yes"/>
        <xdr:attribute type="positionNumber" required="yes"/>
      </xdr:ElementType>
    </xdr:Schema>
    <interbus:Address xmlns:interbus="x-shema:#inlineSchema"
      systemNumber="1"
      segmentNumber="1"
      positionNumber="0"/>
  </UserDefinedBus>
</BusInformation>

```

9 Communication data types – FDTInterbusPCPCCommunicationSchema

Used at:

```

IFdtCommunication::ConnectRequest()
IFdtCommunication::TransactionRequest()

```

```

IFdtCommunication::DisconnectRequest()
IFdtCommunication::Abort()
IFdtCommunication::SequenceBegin()
IFdtCommunication::SequenceEnd()
IFdtCommunication::SequenceStart()
IFdtCommunicationEvents::OnDisconnectResponse()
IFdtCommunicationEvents::OnConnectResponse()
IFdtCommunicationEvents::OnTransactionResponse()

```

```

<Schema name="FDTInterbusPCPCCommunicationSchema" 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="systemNumber" dt:type="ui1"/>
  <AttributeType name="segmentNumber" dt:type="ui1"/>
  <AttributeType name="positionNumber" dt:type="ui1"/>
  <AttributeType name="errorCode" dt:type="bin.hex"/>
  <AttributeType name="index" dt:type="ui2"/>
  <AttributeType name="subIndex" dt:type="ui1"/>
  <AttributeType name="communicationReference" dt:type="uuid"/>
  <AttributeType name="invokeld" dt:type="ui1"/>
  <AttributeType name="reasonCode" dt:type="ui1"/>
  <AttributeType name="abortDetail" dt:type="bin.hex"/>
  <AttributeType name="password" dt:type="ui1"/>
  <AttributeType name="accessGroup" dt:type="ui1"/>
  <AttributeType name="versionOD" dt:type="ui2"/>
  <AttributeType name="profile" dt:type="ui2"/>
  <AttributeType name="protection" dt:type="ui1"/>
  <AttributeType name="manufacturerName" dt:type="string"/>
  <AttributeType name="deviceName" dt:type="string"/>
  <AttributeType name="revision" dt:type="string"/>
  <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="systemNumber" required="yes"/>
    <attribute type="segmentNumber" required="yes"/>
    <attribute type="positionNumber" required="yes"/>
    <attribute type="password" required="yes"/>
    <attribute type="accessGroup" required="yes"/>
  </ElementType>
  <ElementType name="ConnectResponse" content="empty" model="closed">
    <attribute type="fdt:nodeId" required="no"/>
    <attribute type="systemNumber" required="yes"/>
    <attribute type="segmentNumber" required="yes"/>
    <attribute type="positionNumber" required="yes"/>
    <attribute type="versionOD" required="yes"/>
    <attribute type="profile" required="yes"/>
    <attribute type="protection" required="yes"/>
    <attribute type="communicationReference" required="yes"/>
    <attribute type="errorCode" required="yes"/>
  </ElementType>
  <ElementType name="DisconnectRequest" content="empty" model="closed">
    <attribute type="fdt:nodeId" required="no"/>
    <attribute type="reasonCode" required="yes"/>
    <attribute type="abortDetail" required="yes"/>
    <attribute type="communicationReference" required="yes"/>
  </ElementType>
  <ElementType name="DisconnectResponse" content="empty" model="closed">
    <attribute type="fdt:nodeId" required="no"/>
    <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="invokeld" required="yes"/>
    <attribute type="index" required="yes"/>

```

```

        <attribute type="subIndex" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="ReadResponse" 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="1" maxOccurs="1"/>
    </ElementType>
    <ElementType name="WriteRequest" content="eltOnly" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="invokeld" required="yes"/>
        <attribute type="index" required="yes"/>
        <attribute type="subIndex" 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="communicationReference" required="yes"/>
        <attribute type="errorCode" required="yes"/>
    </ElementType>
    <ElementType name="IdentifyRequest" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="invokeld" required="yes"/>
        <attribute type="communicationReference" required="yes"/>
    </ElementType>
    <ElementType name="IdentifyResponse" content="empty" model="closed">
        <attribute type="fdt:nodeId" required="no"/>
        <attribute type="communicationReference" required="yes"/>
        <attribute type="manufacturerName" required="yes"/>
        <attribute type="deviceName" required="yes"/>
        <attribute type="revision" 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="yes"/>
        <attribute type="reasonCode" required="yes"/>
        <attribute type="abortDetail" required="yes"/>
    </ElementType>
    <ElementType name="FDT" content="eltOnly" model="closed">
        <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="IdentifyRequest"/>
            <element type="IdentifyResponse"/>
            <element type="SequenceBegin"/>
            <element type="SequenceEnd"/>
            <element type="SequenceStart"/>
            <element type="Abort"/>
            <element type="fdt:CommunicationError"/>
        </group>
    </ElementType>

```

```
</ElementType>
</Schema>
```

Example:**Read request:**

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTInterbusPCPCommunicationSchema.xml" xmlns:fdt="x-
schema:FDTDataTypesSchema.xml">
  <ReadRequest invokeld="0" index="35" subIndex="0" communicationReference="81788AD7-C4C7-48fd-AFE6-
FE99BA44F200"/>
</FDT>
```

Write request:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTInterbusPCPCommunicationSchema.xml" xmlns:fdt="x-
schema:FDTDataTypesSchema.xml">
  <WriteRequest invokeld="0" index="1" subIndex="0" communicationReference="81788AD7-C4C7-48fd-AFE6-
FE99BA44F200">
    <fdt:CommunicationData byteArray="010203a0b0"/>
  </WriteRequest>
</FDT>
```

Write response:

```
<?xml version="1.0"?>
<FDT xmlns="x-schema:FDTInterbusPCPCommunicationSchema.xml" xmlns:fdt="x-
schema:FDTDataTypesSchema.xml">
  <WriteResponse communicationReference="81788AD7-C4C7-48fd-AFE6-FE99BA44F200" errorCode=""/>
</FDT>
```

10 Channel parameter data types – FDTInterbusChannelParameterSchema

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

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

```
<Schema name="FDTInterbusChannelParameterSchema" 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="index" dt:type="ui2"/>
  <AttributeType name="subIndex" dt:type="ui1"/>
  <AttributeType name="invokeld" 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="logic" dt:type="enumeration" dt:values="positive negative"/>
  <AttributeType name="protectedByChannelAssignment" dt:type="boolean"/>
  <AttributeType name="simulationBit" dt:type="ui4"/>
  <AttributeType name="statusChannel" dt:type="boolean"/>
  <AttributeType name="substituteValueBit" dt:type="ui4"/>
  <!--Definition of Elements-->
  <ElementType name="ProcessAddress" content="empty" model="closed">
    <attribute type="fdt:nodeId" required="no"/>
    <attribute type="bitPosition" required="yes"/>
    <attribute type="bitLength" required="yes"/>
  </ElementType>
  <ElementType name="PcpAddress" content="empty" model="closed">
    <attribute type="fdt:nodeId" required="no"/>
    <attribute type="invokeld" required="yes"/>
    <attribute type="index" required="yes"/>
  </ElementType>
</Schema>
```

```

    <attribute type="subIndex" required="yes"/>
</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="protectedByChannelAssignment" required="yes"/>
    <attribute type="fdt:dataType" required="yes"/>
    <attribute type="fdt:signalType" required="yes"/>
    <attribute type="frameApplicationTag" required="no"/>
    <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="ProcessAddress" minOccurs="0" maxOccurs="1"/>
    <element type="PcpAddress" 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:SubstituteValue" minOccurs="0" maxOccurs="1"/>
</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="fdt:nodeId" required="no"/>
    <element type="FDTChannelType" minOccurs="1" maxOccurs="1"/>
    <element type="FDTChannel" minOccurs="1" maxOccurs="1"/>
</ElementType>
</Schema>

```

11 Device identification

11.1 Device type identification data types – FDTInterbusIdentSchema

```

<Schema name="FDTInterbusIdentSchema" 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_IBS protocol_IBS_PCP protocol_IBS_BASE_PROFILE"/>
    <!--
    <!--          IBS
    <!--          Simple Interbus Device
    <!--          Config Frame Data
    <!--
    <AttributeType name="systemNumber" dt:type="ui1"/>
    <AttributeType name="segmentNumber" dt:type="ui1"/>
    <AttributeType name="positionNumber" dt:type="ui1"/>
    <AttributeType name="identCode" dt:type="ui1"/>
    <AttributeType name="PDLlength" dt:type="ui1"/>
    <AttributeType name="PALength" dt:type="ui1"/>
    <!--
    <!--          IBS_PCP
    <!--          Standard PCP devices
    <!--          Data from Identify Confirmation
    <!--
    <AttributeType name="deviceName" dt:type="string"/>
    <AttributeType name="manufacturerName" dt:type="string"/>

```

```

<AttributeType name="firmwareRevision" dt:type="string"/>
<!-- -->
<!-- IBS_BASE_PROFILE -->
<!-- Base Profile devices -->
<!-- -->
<AttributeType name="hardwareRevision" dt:type="string"/>
<AttributeType name="orderId" dt:type="string"/>
<AttributeType name="vendorId" dt:type="ui8"/>
<AttributeType name="deviceFamily" dt:type="string"/>
<AttributeType name="pcpVersion" dt:type="string"/>
<AttributeType name="commProfile" dt:type="string"/>
<!-- -->
<!-- general -->
<!-- -->
<AttributeType name="idDTMSupportLevel" dt:type="enumeration" dt:values="genericSupport profileSupport
blockspecificProfileSupport specificSupport"/>
<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 – DTMIInterbusDeviceSchema

Used at IDtmEvents::OnScanResponse()

The XML document describes one entry in the list of scanned INTERBUS devices.

```

<Schema name="DTMIInterbusDeviceSchema" 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="systemNumber" dt:type="ui1"/>
  <AttributeType name="segmentNumber" dt:type="ui1"/>
  <AttributeType name="positionNumber" dt:type="ui1"/>
  <AttributeType name="identCode" dt:type="ui1"/>
  <AttributeType name="PALength" dt:type="ui1"/>
  <AttributeType name="PDLength" dt:type="ui1"/>
  <!--Definition of Elements-->
  <ElementType name="InterbusDevice" content="mixed" model="closed">
    <attribute type="fdt:nodeId" required="no"/>
    <attribute type="systemNumber" required="yes"/>
    <attribute type="segmentNumber" required="yes"/>
    <attribute type="positionNumber" required="yes"/>
    <attribute type="identCode" required="yes"/>
    <attribute type="PALength" required="yes"/>
    <attribute type="PDLength" required="yes"/>
    <element type="fdt:VersionInformation" minOccurs="1" maxOccurs="1"/>
  </ElementType>
</Schema>

```

Example (the inline-schema may be deleted in case the FDT Frame Application knows the DTMIInterbusDeviceSchema):

```

<?xml version="1.0"?>
<TopologyScan xmlns="x-schema:DTMTopologyScanSchema.xml" xmlns:fdt="x-
schema:FDTDataTypesSchema.xml" xmlns:fdtinterbusdevice="x-schema:#DTMIInterbusDeviceSchema.xml"
xmlns:xdr="urn:schemas-microsoft-com:xml-data" xmlns:dt="urn:schemas-microsoft-com:datatypes">
  <xdr:Schema name="DTMIInterbusDeviceSchema.xml">
    <xdr:AttributeType name="systemNumber" dt:type="ui1"/>
    <xdr:AttributeType name="segmentNumber" dt:type="ui1"/>
    <xdr:AttributeType name="positionNumber" dt:type="ui1"/>
    <xdr:AttributeType name="identCode" dt:type="ui1"/>
    <xdr:AttributeType name="PALength" dt:type="ui1"/>
    <xdr:AttributeType name="PDLength" dt:type="ui1"/>
    <xdr:ElementType name="InterbusDevice" content="mixed" model="closed">
      <xdr:attribute type="fdt:nodeId" required="no"/>

```

```

    <xdr:attribute type="systemNumber" required="yes"/>
    <xdr:attribute type="segmentNumber" required="yes"/>
    <xdr:attribute type="positionNumber" required="yes"/>
    <xdr:attribute type="identCode" required="yes"/>
    <xdr:attribute type="PALength" required="yes"/>
    <xdr:attribute type="PDLLength" required="yes"/>
    <xdr:element type="fdt:VersionInformation" minOccurs="1" maxOccurs="1"/>
  </xdr:ElementType>
</xdr:Schema>
<!-- example for interbus device -->
<fdtinterbusdevice:InterbusDevice systemNumber="0" segmentNumber="0" positionNumber="0" identCode="0"
PALength="0" PDLLength="0">
  <fdt:VersionInformation name="dtm" vendor="unknown"/>
</fdtinterbusdevice:InterbusDevice>
</TopologyScan>

```

11.3 Scan identification data types – FDTInterbusScanIdentSchema

This schema defines the XML document provided by a scan response of a Interbus network.

```

<Schema name="FDTInterbusScanIdentSchema" xmlns="urn:schemas-microsoft-com:xml-data"
xmlns:dt="urn:schemas-microsoft-com:datatypes" xmlns:ibsidnt="x-schema:FDTInterbusIdentSchema.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-->
  <!--
      -->
  <!--
      IBS
      -->
  <!--
      -->
  <ElementType name="IdAddress" content="empty" model="closed">
    <attribute type="ibsidnt:systemNumber" required="yes"/>
    <attribute type="ibsidnt:segmentNumber" required="yes"/>
    <attribute type="ibsidnt:positionNumber" required="yes"/>
  </ElementType>
  <ElementType name="IdBusProtocol" content="empty" model="closed">
    <attribute type="ibsidnt:busProtocol" required="yes"/>
  </ElementType>
  <ElementType name="TypeIDIBS" content="empty" model="closed">
    <attribute type="ibsidnt:identCode" required="yes"/>
    <attribute type="ibsidnt:PALength" required="yes"/>
    <attribute type="ibsidnt:PDLLength" required="yes"/>
  </ElementType>
  <!--
      -->
  <!--
      IBS PCP
      -->
  <!--
      -->
  <ElementType name="IdTypeID" content="empty" model="closed">
    <attribute type="ibsidnt:deviceName" required="yes"/>
  </ElementType>
  <ElementType name="IdManufacturer" content="empty" model="closed">
    <attribute type="ibsidnt:manufacturerName" required="yes"/>
  </ElementType>
  <ElementType name="IdSoftwareRevision" content="empty" model="closed">
    <attribute type="ibsidnt:firmwareRevision" required="yes"/>
  </ElementType>
  <ElementType name="IdentCode" content="empty" model="closed">
    <attribute type="ibsidnt:identCode" required="yes"/>
  </ElementType>
  <ElementType name="ProcessLength" content="empty" model="closed">
    <attribute type="ibsidnt:PDLLength" required="yes"/>
  </ElementType>
  <ElementType name="ParamLength" content="empty" model="closed">
    <attribute type="ibsidnt:PALength" required="yes"/>
  </ElementType>
  <!--
      -->
  <!--
      IBS Base Profile
      -->
  <!--
      -->

```

```

<ElementType name="IdHardwareRevision" content="empty" model="closed">
  <attribute type="ibsident:hardwareRevision" required="yes"/>
</ElementType>
<ElementType name="OrderId" content="empty" model="closed">
  <attribute type="ibsident:orderId" required="yes"/>
</ElementType>
<ElementType name="VendorId" content="empty" model="closed">
  <attribute type="ibsident:vendorId" required="yes"/>
</ElementType>
<ElementType name="DeviceFamily" content="empty" model="closed">
  <attribute type="ibsident:deviceFamily" required="yes"/>
</ElementType>
<ElementType name="PCPVersion" content="empty" model="closed">
  <attribute type="ibsident:pcpVersion" required="yes"/>
</ElementType>
<ElementType name="CommProfile" content="empty" model="closed">
  <attribute type="ibsident:commProfile" required="yes"/>
</ElementType>
<ElementType name="ManufacturerSpecificExtension" content="empty" model="closed">
  <attribute type="ibsident:manufacturerSpecificExtension" required="yes"/>
</ElementType>
<ElementType name="ScanIdentification_IBS" 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="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
  <element type="IdTypeIDBS" minOccurs="1" maxOccurs="1"/>
  <!-- manufacturer specific extension, added in manufacturer specific identification -->
  <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
</ElementType>
<ElementType name="ScanIdentification_IBS_PCP" 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="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
  <element type="IdManufacturer" minOccurs="1" maxOccurs="1"/>
  <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
  <element type="IdSoftwareRevision" minOccurs="1" maxOccurs="1"/>
  <element type="IdCode" minOccurs="1" maxOccurs="1"/>
  <element type="ProcessLength" minOccurs="1" maxOccurs="1"/>
  <element type="ParamLength" minOccurs="1" maxOccurs="1"/>
  <!-- manufacturer specific extension, added in manufacturer specific identification -->
  <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
</ElementType>
<ElementType name="ScanIdentification_IBS_BASE_PROFILE" 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="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
  <element type="IdManufacturer" minOccurs="1" maxOccurs="1"/>
  <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
  <element type="IdSoftwareRevision" minOccurs="1" maxOccurs="1"/>
  <element type="IdHardwareRevision" minOccurs="1" maxOccurs="1"/>
  <element type="IdCode" minOccurs="1" maxOccurs="1"/>
  <element type="ProcessLength" minOccurs="1" maxOccurs="1"/>
  <element type="ParamLength" minOccurs="1" maxOccurs="1"/>
  <element type="OrderId" minOccurs="1" maxOccurs="1"/>
  <element type="VendorId" minOccurs="1" maxOccurs="1"/>
  <element type="DeviceFamily" minOccurs="1" maxOccurs="1"/>
  <element type="PCPVersion" minOccurs="1" maxOccurs="1"/>
  <element type="CommProfile" 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_IBS" minOccurs="0" maxOccurs="*" />
      <element type="ScanIdentification_IBS_PCP" minOccurs="0" maxOccurs="*" />
      <element type="ScanIdentification_IBS_BASE_PROFILE" 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 – FDTInterbusDeviceIdentSchema

This subclause defines data types that are used to protocol specific information for device types.

```

<Schema name="FDTInterbusDeviceIdentSchema" xmlns="urn:schemas-microsoft-com:xml-data"
  xmlns:dt="urn:schemas-microsoft-com:datatypes" xmlns:ibsid="x-schema:FDTInterbusIdentSchema.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="ibsid:busProtocol" required="no"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <!-- -->
  <!-- IBS -->
  <!-- -->
  <ElementType name="TypeIDIBS" content="eltOnly" model="closed">
    <attribute type="ibsid:identCode" required="no"/>
    <attribute type="ibsid:PALength" required="no"/>
    <attribute type="ibsid:PDLlength" required="no"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <!-- -->
  <!-- PCP -->
  <!-- -->
  <ElementType name="IdTypeID" content="eltOnly" model="closed">
    <attribute type="ibsid:deviceName" required="no"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <ElementType name="IdManufacturer" content="eltOnly" model="closed">
    <attribute type="ibsid:manufacturerName" required="no"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <ElementType name="IdSoftwareRevision" content="eltOnly" model="closed">
    <attribute type="ibsid:firmwareRevision" required="no"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <ElementType name="IdentCode" content="eltOnly" model="closed">
    <attribute type="ibsid:identCode" required="yes"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <ElementType name="ProcessLength" content="eltOnly" model="closed">
    <attribute type="ibsid:PDLlength" required="yes"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <ElementType name="ParamLength" content="eltOnly" model="closed">
    <attribute type="ibsid:PALength" required="yes"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <!-- -->
  <!-- IBS Base Profile -->
  <!-- -->
  <ElementType name="IdHardwareRevision" content="eltOnly" model="closed">
    <attribute type="ibsid:hardwareRevision" required="no"/>
    <element type="ibsid:RegExpr" minOccurs="0" maxOccurs="*" />
  </ElementType>
  <ElementType name="OrderId" content="eltOnly" model="closed">

```

```

    <attribute type="ibsident:orderId" required="no"/>
    <element type="ibsident:RegExpr" minOccurs="0" maxOccurs="**"/>
  </ElementType>
  <ElementType name="VendorId" content="eltOnly" model="closed">
    <attribute type="ibsident:vendorId" required="no"/>
    <element type="ibsident:RegExpr" minOccurs="0" maxOccurs="**"/>
  </ElementType>
  <ElementType name="DeviceFamily" content="eltOnly" model="closed">
    <attribute type="ibsident:deviceFamily" required="no"/>
    <element type="ibsident:RegExpr" minOccurs="0" maxOccurs="**"/>
  </ElementType>
  <ElementType name="PCPVersion" content="eltOnly" model="closed">
    <attribute type="ibsident:pcpVersion" required="no"/>
    <element type="ibsident:RegExpr" minOccurs="0" maxOccurs="**"/>
  </ElementType>
  <ElementType name="CommProfile" content="eltOnly" model="closed">
    <attribute type="ibsident:commProfile" required="no"/>
    <element type="ibsident:RegExpr" minOccurs="0" maxOccurs="**"/>
  </ElementType>
  <!-- -->
  <!-- -->
  <!-- -->
  <ElementType name="ManufacturerSpecificExtension" content="empty" model="closed">
    <attribute type="ibsident:manufacturerSpecificExtension" required="yes"/>
  </ElementType>
  <ElementType name="DeviceIdentification_IBS" content="eltOnly" model="closed">
    <attribute type="ibsident:idDTMSupportLevel" required="yes"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <element type="TypeIdIBS" minOccurs="1" maxOccurs="1"/>
    <!-- manufacturer specific extension, added in manufacturer specific identification -->
    <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
  </ElementType>
  <ElementType name="DeviceIdentification_IBS_PCP" content="eltOnly" model="closed">
    <attribute type="ibsident:idDTMSupportLevel" required="yes"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <element type="IdManufacturer" minOccurs="1" maxOccurs="1"/>
    <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
    <element type="IdSoftwareRevision" minOccurs="1" maxOccurs="1"/>
    <element type="IdentCode" minOccurs="1" maxOccurs="1"/>
    <element type="ProcessLength" minOccurs="1" maxOccurs="1"/>
    <element type="ParamLength" minOccurs="1" maxOccurs="1"/>
    <!-- manufacturer specific extension, added in manufacturer specific identification -->
    <element type="ManufacturerSpecificExtension" minOccurs="0" maxOccurs="1"/>
  </ElementType>
  <ElementType name="DeviceIdentification_IBS_BASE_PROFILE" content="eltOnly" model="closed">
    <attribute type="ibsident:idDTMSupportLevel" required="yes"/>
    <element type="IdBusProtocol" minOccurs="1" maxOccurs="1"/>
    <element type="IdManufacturer" minOccurs="1" maxOccurs="1"/>
    <element type="IdTypeID" minOccurs="1" maxOccurs="1"/>
    <element type="IdSoftwareRevision" minOccurs="1" maxOccurs="1"/>
    <element type="IdHardwareRevision" minOccurs="1" maxOccurs="1"/>
    <element type="IdentCode" minOccurs="1" maxOccurs="1"/>
    <element type="ProcessLength" minOccurs="1" maxOccurs="1"/>
    <element type="ParamLength" minOccurs="1" maxOccurs="1"/>
    <element type="OrderId" minOccurs="1" maxOccurs="1"/>
    <element type="VendorId" minOccurs="1" maxOccurs="1"/>
    <element type="DeviceFamily" minOccurs="1" maxOccurs="1"/>
    <element type="PCPVersion" minOccurs="1" maxOccurs="1"/>
    <element type="CommProfile" 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_IBS" minOccurs="0" maxOccurs="**"/>
      <element type="DeviceIdentification_IBS_PCP" minOccurs="0" maxOccurs="**"/>
      <element type="DeviceIdentification_IBS_BASE_PROFILE" 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 Interbus device identification xml files
-->
<xsl:transform xmlns:xsl="http://www.w3.org/1999/XSL/Transform" xmlns:str="http://xslt.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:ibsid="x-schema:FDTInterbusIdentSchema.xml"
xmlns:ibdevice="x-schema:FDTInterbusDeviceTypeIdentSchema.xml" xmlns:ibsscan="x-
schema:FDTInterbusScanIdentSchema.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="//ibsscan:ScanIdentifications"/>
    <xsl:apply-templates select="//ibdevice:DeviceIdentifications"/>
  </xsl:template>
  <!--
INTERBUS identification list
  -->
  <xsl:template match="ibdevice:DeviceIdentifications">
    <xsl:text disable-output-escaping="yes">&lt;?xml version="1.0"?&gt;
    &lt;!-- This file is created by FDTInterbusIdentTransformation.xsl after transformation of
InterbusDTMDeviceIdentificationInstance.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="ibdevice:DeviceIdentification_IBS"/>
      <xsl:apply-templates select="ibdevice:DeviceIdentification_IBS_PCP"/>
      <xsl:apply-templates select="ibdevice:DeviceIdentification_IBS_BASE_PROFILE"/>
    </xsl:element>
    <xsl:text disable-output-escaping="yes">&lt;/FDT&gt;</xsl:text>
  </xsl:template>
  <!--
INTERBUS catalog identification
  -->
  <xsl:template match="ibdevice:DeviceIdentification_IBS">
    <xsl:element name="DeviceIdentification">
      <xsl:attribute name="ident:idDTMSupportLevel"><xsl:value-of
select="@ibsid:idDTMSupportLevel"/></xsl:attribute>
      <xsl:element name="IdBusProtocol">
        <xsl:attribute name="ident:protocolSpecificName">INTERBUS</xsl:attribute>
        <xsl:attribute name="ident:value"><xsl:value-of
select="ibdevice:IdBusProtocol/@ibsid: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="ibdevice:TypeIDIBS"/>
      <xsl:element name="IdSoftwareRevision">
        <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
      </xsl:element>
    </xsl:element>
  </xsl:template>
  <!--
```

```

        </xsl:element>
        <xsl:element name="IdHardwareRevision">
            <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
        </xsl:element>
    </xsl:element>
</xsl:template>
<!--
Interbus scan identification
-->
    <xsl:template match="ibsscan:ScanIdentification_IBS">
        <xsl:element name="ScanIdentification">
            <xsl:apply-templates select="@configuredState"/>
            <xsl:apply-templates select="fdt:CommunicationError"/>
            <xsl:element name="IdBusProtocol">
                <xsl:attribute name="ident:protocolSpecificName">INTERBUS</xsl:attribute>
                <xsl:attribute name="ident:value"><xsl:value-of
select="ibsscan:IdBusProtocol/@ibsid:busProtocol"/></xsl:attribute>
            </xsl:element>
            <xsl:apply-templates select="ibsscan:IdBusProtocol"/>
            <xsl:element name="IdBusProtocolVersion">
                <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
            </xsl:element>
            <xsl:apply-templates select="ibsscan:IdAddress"/>
            <xsl:element name="IdManufacturer">
                <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
            </xsl:element>
            <xsl:apply-templates select="ibsscan:TypeIDIBS"/>
            <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>
    </xsl:template>
<!--
Interbus PCP catalog identification
-->
    <xsl:template match="ibdevice:DeviceIdentification_IBS_PCP">
        <xsl:element name="DeviceIdentification">
            <xsl:attribute name="ident:idDTMSupportLevel"><xsl:value-of
select="@ibsid:ident:idDTMSupportLevel"/></xsl:attribute>
            <xsl:element name="IdBusProtocol">
                <xsl:attribute name="ident:protocolSpecificName">INTERBUS PCP</xsl:attribute>
                <xsl:attribute name="ident:value"><xsl:value-of
select="ibdevice:IdBusProtocol/@ibsid:busProtocol"/></xsl:attribute>
            </xsl:element>
            <xsl:element name="IdBusProtocolVersion">
                <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
            </xsl:element>
            <xsl:apply-templates select="ibdevice:IdManufacturer"/>
            <xsl:apply-templates select="ibdevice:IdTypeID"/>
            <xsl:apply-templates select="ibdevice:IdSoftwareRevision"/>
            <xsl:element name="IdHardwareRevision">
                <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
            </xsl:element>
            <xsl:element name="IdValues">
                <xsl:apply-templates select="ibdevice:IdentCode"/>
                <xsl:apply-templates select="ibdevice:ProcessLength"/>
                <xsl:apply-templates select="ibdevice:ParamLength"/>
            </xsl:element>
        </xsl:element>
    </xsl:template>
<!--

```

Interbus PCP scan identification

```
-->
  <xsl:template match="ibsscan:ScanIdentification_IBS_PCP">
    <xsl:element name="ScanIdentification">
      <xsl:apply-templates select="@configuredState"/>
      <xsl:apply-templates select="fdt:CommunicationError"/>
      <xsl:element name="IdBusProtocol">
        <xsl:attribute name="ident:protocolSpecificName">INTERBUS PCP</xsl:attribute>
        <xsl:attribute name="ident:value"><xsl:value-of
select="ibsscan:IdBusProtocol/@ibsident:busProtocol"/></xsl:attribute>
      </xsl:element>
      <xsl:element name="IdBusProtocolVersion">
        <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
      </xsl:element>
      <xsl:apply-templates select="ibsscan:IdAddress"/>
      <xsl:apply-templates select="ibsscan:IdManufacturer"/>
      <xsl:apply-templates select="ibsscan:IdTypeID"/>
      <xsl:apply-templates select="ibsscan:IdSoftwareRevision"/>
      <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="ibsscan:IdentCode"/>
        <xsl:apply-templates select="ibsscan:ProcessLength"/>
        <xsl:apply-templates select="ibsscan:ParamLength"/>
      </xsl:element>
    </xsl:element>
  </xsl:template>
```

<!--

IBS Base Profile catalog identification

```
-->
  <xsl:template match="ibsdevice:DeviceIdentification_IBS_BASE_PROFILE">
    <xsl:element name="DeviceIdentification">
      <xsl:attribute name="ident:idDTMSupportLevel"><xsl:value-of
select="@ibsident:idDTMSupportLevel"/></xsl:attribute>
      <xsl:element name="IdBusProtocol">
        <xsl:attribute name="ident:protocolSpecificName">Profile</xsl:attribute>
        <xsl:attribute name="ident:value"><xsl:value-of
select="ibsdevice:IdBusProtocol/@ibsident:busProtocol"/></xsl:attribute>
      </xsl:element>
      <xsl:element name="IdBusProtocolVersion">
        <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
      </xsl:element>
      <xsl:apply-templates select="ibsdevice:IdManufacturer"/>
      <xsl:apply-templates select="ibsdevice:IdTypeID"/>
      <xsl:apply-templates select="ibsdevice:IdSoftwareRevision"/>
      <xsl:apply-templates select="ibsdevice:IdHardwareRevision"/>
      <xsl:element name="IdValues">
        <xsl:apply-templates select="ibsdevice:IdentCode"/>
        <xsl:apply-templates select="ibsdevice:ProcessLength"/>
        <xsl:apply-templates select="ibsdevice:ParamLength"/>
        <xsl:apply-templates select="ibsdevice:OrderId"/>
        <xsl:apply-templates select="ibsdevice:VendorId"/>
        <xsl:apply-templates select="ibsdevice:DeviceFamily"/>
        <xsl:apply-templates select="ibsdevice:PCPVersion"/>
        <xsl:apply-templates select="ibsdevice:CommProfile"/>
      </xsl:element>
    </xsl:element>
  </xsl:template>
```

<!--

IBS Base Profile scan identification

```
-->
  <xsl:template match="ibsscan:ScanIdentification_IBS_BASE_PROFILE">
    <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="ibsscan:IdBusProtocol/@ibsident:busProtocol"/></xsl:attribute>
        </xsl:element>
        <xsl:element name="IdBusProtocolVersion">
            <xsl:attribute name="ident:protocolSpecificName">not applicable</xsl:attribute>
        </xsl:element>
        <xsl:apply-templates select="ibsscan:IdAddress"/>
            <xsl:apply-templates select="ibsscan:IdManufacturer"/>
            <xsl:apply-templates select="ibsscan:IdTypeID"/>
        <xsl:apply-templates select="ibsscan:IdSoftwareRevision"/>
        <xsl:apply-templates select="ibsscan: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="ibsscan:IdentCode"/>
                <xsl:apply-templates select="ibsscan:ProcessLength"/>
                <xsl:apply-templates select="ibsscan:ParamLength"/>
            <xsl:apply-templates select="ibsscan:OrderId"/>
            <xsl:apply-templates select="ibsscan:VendorId"/>
            <xsl:apply-templates select="ibsscan:DeviceFamily"/>
            <xsl:apply-templates select="ibsscan:PCPVersion"/>
            <xsl:apply-templates select="ibsscan:CommProfile"/>
        </xsl:element>
    </xsl:element>
</xsl:template>
<!--
scan list
-->
    <xsl:template match="ibsscan:ScanIdentifications">
        <xsl:text disable-output-escaping="yes">&lt;?xml version="1.0"?&gt;
        &lt;!-- This file is created by FDTInterbusIdentTransformation.xsl after transformation of
InterbusDTMScanIdentificationInstance.xml --&gt;&lt;FDT xmlns="x-schema:DTMScanIdentSchema.xml"
xmlns:ident="x-schema:DTMIdentSchema.xml" xmlns:fdt="x-schema:FDTDDataTypesSchema.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="ibsscan:ScanIdentification_IBS"/>
            <xsl:apply-templates select="ibsscan:ScanIdentification_IBS_PCP"/>
            <xsl:apply-templates select="ibsscan:ScanIdentification_IBS_BASE_PROFILE"/>
        </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="ibsscan:IdTag">
        <xsl:element name="IdDeviceTag">
            <xsl:attribute name="ident:value"><xsl:value-of select="@ibsident:deviceTAG"/></xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">DeviceTag</xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
communicationError
-->
    <xsl:template match="fdt:CommunicationError">

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```

        <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="ibsscan:IdSerialNumber">
        <xsl:element name="IdSerialNumber">
            <xsl:attribute name="ident:value"><xsl:value-of select="@ibsid:serialNumber"/></xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">SerialNumber</xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
busaddress
-->
    <xsl:template match="ibsscan:IdAddress">
        <xsl:element name="IdAddress">
            <xsl:attribute name="ident:value"><xsl:value-of select="@ibsid:systemNumber"/>.<xsl:value-of
select="@ibsid:segmentNumber"/>.<xsl:value-of select="@ibsid:positionNumber"/></xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">Logical Device Number</xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
Order Number
-->
    <xsl:template match="ibsdevice:OrderId">
        <xsl:param name="value" select="@ibsid:orderId"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:name">OrderNumber</xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">OrderNumber</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="ibsscan:OrderId">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">OrderNumber</xsl:attribute>
            <xsl:attribute name="ident:name">OrderNumber</xsl:attribute>
            <xsl:attribute name="ident:value"><xsl:value-of select="@ibsid:orderId"/></xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
Vendor_Id
-->
    <xsl:template match="ibsdevice:VendorId">
        <xsl:param name="value" select="@ibsid:vendorId"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:name">VendorID</xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">VendorID</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="ibsscan:VendorId">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">VendorID</xsl:attribute>
            <xsl:attribute name="ident:name">VendorID</xsl:attribute>
            <xsl:attribute name="ident:value"><xsl:value-of select="@ibsid:vendorId"/></xsl:attribute>
        </xsl:element>
    </xsl:template>
<!--
Device_Family
-->

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```

<xsl:template match="ibsdevice:DeviceFamily">
  <xsl:param name="value" select="@ibsident:deviceFamily"/>
  <xsl:element name="IdValue">
    <xsl:attribute name="ident:name">DeviceFamily</xsl:attribute>
    <xsl:attribute name="ident:protocolSpecificName">DeviceFamily</xsl:attribute>
    <xsl:call-template name="genMatch">
      <xsl:with-param name="value" select="$value"/>
    </xsl:call-template>
  </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:DeviceFamily">
  <xsl:element name="IdValue">
    <xsl:attribute name="ident:protocolSpecificName">DeviceFamily</xsl:attribute>
    <xsl:attribute name="ident:name">DeviceFamily</xsl:attribute>
    <xsl:attribute name="ident:value"><xsl:value-of select="@ibsident:deviceFamily"/></xsl:attribute>
  </xsl:element>
</xsl:template>

<!--
PCP_Version
-->
<xsl:template match="ibsdevice:PCPVersion">
  <xsl:param name="value" select="@ibsident:pcpVersion"/>
  <xsl:element name="IdValue">
    <xsl:attribute name="ident:name">PCPVersion</xsl:attribute>
    <xsl:attribute name="ident:protocolSpecificName">PCPVersion</xsl:attribute>
    <xsl:call-template name="genMatch">
      <xsl:with-param name="value" select="$value"/>
    </xsl:call-template>
  </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:PCPVersion">
  <xsl:element name="IdValue">
    <xsl:attribute name="ident:protocolSpecificName">PCPVersion</xsl:attribute>
    <xsl:attribute name="ident:name">PCPVersion</xsl:attribute>
    <xsl:attribute name="ident:value"><xsl:value-of select="@ibsident:pcpVersion"/></xsl:attribute>
  </xsl:element>
</xsl:template>

<!--
Comm_Profile
-->
<xsl:template match="ibsdevice:CommProfile">
  <xsl:param name="value" select="@ibsident:commProfile"/>
  <xsl:element name="IdValue">
    <xsl:attribute name="ident:name">CommProfile</xsl:attribute>
    <xsl:attribute name="ident:protocolSpecificName">CommProfile</xsl:attribute>
    <xsl:call-template name="genMatch">
      <xsl:with-param name="value" select="$value"/>
    </xsl:call-template>
  </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:CommProfile">
  <xsl:element name="IdValue">
    <xsl:attribute name="ident:protocolSpecificName">CommProfile</xsl:attribute>
    <xsl:attribute name="ident:name">CommProfile</xsl:attribute>
    <xsl:attribute name="ident:value"><xsl:value-of select="@ibsident:commProfile"/></xsl:attribute>
  </xsl:element>
</xsl:template>

<!--
Ident Code
-->
<xsl:template match="ibsdevice:IdentCode">
  <xsl:param name="value" select="@ibsident:identCode"/>
  <xsl:element name="IdValue">
    <xsl:attribute name="ident:name">Ident Code</xsl:attribute>
    <xsl:attribute name="ident:protocolSpecificName">Ident Code</xsl:attribute>
    <xsl:call-template name="genMatch">
      <xsl:with-param name="value" select="$value"/>

```

```

        </xsl:call-template>
    </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:IdentCode">
    <xsl:element name="IdValue">
        <xsl:attribute name="ident:protocolSpecificName">Ident Code</xsl:attribute>
        <xsl:attribute name="ident:name">Ident Code</xsl:attribute>
        <xsl:attribute name="ident:value"><xsl:value-of select="@ibsid:identCode"/></xsl:attribute>
    </xsl:element>
</xsl:template>

<!--
Process Data Length
-->
    <xsl:template match="ibssdevice:ProcessLength">
        <xsl:param name="value" select="@ibsid:PDLength"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:name">Process Data Length</xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">Process Data Length</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="ibsscan:ProcessLength">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Process Data Length</xsl:attribute>
            <xsl:attribute name="ident:name">Process Data Length</xsl:attribute>
            <xsl:attribute name="ident:value"><xsl:value-of select="@ibsid:PDLength"/></xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
Parameter Channel Length
-->
    <xsl:template match="ibssdevice:ParamLength">
        <xsl:param name="value" select="@ibsid:PALength"/>
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:name">Parameter Channel Length</xsl:attribute>
            <xsl:attribute name="ident:protocolSpecificName">Parameter Channel Length</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$value"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="ibsscan:ParamLength">
        <xsl:element name="IdValue">
            <xsl:attribute name="ident:protocolSpecificName">Parameter Channel Length</xsl:attribute>
            <xsl:attribute name="ident:name">Parameter Channel Length</xsl:attribute>
            <xsl:attribute name="ident:value"><xsl:value-of select="@ibsid:PALength"/></xsl:attribute>
        </xsl:element>
    </xsl:template>

<!--
Manufacturer Name
-->
    <xsl:template match="ibssdevice:IdManufacturer">
        <xsl:param name="manid" select="@ibsid:manufacturerName"/>
        <xsl:element name="IdManufacturer">
            <xsl:attribute name="ident:protocolSpecificName">VendorName</xsl:attribute>
            <xsl:call-template name="genMatch">
                <xsl:with-param name="value" select="$manid"/>
            </xsl:call-template>
        </xsl:element>
    </xsl:template>
    <xsl:template match="ibsscan:IdManufacturer">
        <xsl:element name="IdManufacturer">
            <xsl:attribute name="ident:protocolSpecificName">VendorName</xsl:attribute>

```

```

        <xsl:attribute name="ident:value"><xsl:value-of select="@ibsident:manufacturerName"/></xsl:attribute>
    </xsl:element>
</xsl:template>

<!--
device type for Simple Interbus Devices
-->
<xsl:template match="ibdevice:TypeIDIBS">
    <xsl:param name="value1" select="@ibsident:identCode"/>
    <xsl:param name="value2" select="@ibsident:PDLength"/>
    <xsl:param name="value3" select="@ibsident:PALength"/>
    <xsl:element name="IdTypeID">
        <xsl:call-template name="genIbsMatch">
            <xsl:with-param name="value1" select="$value1"/>
            <xsl:with-param name="value2" select="$value2"/>
            <xsl:with-param name="value3" select="$value3"/>
        </xsl:call-template>
        <xsl:attribute name="ident:protocolSpecificName">Ident-Code/PDLength/PALength</xsl:attribute>
    </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:TypeIDIBS">
    <xsl:element name="IdTypeID">
        <xsl:attribute name="ident:value"><xsl:value-of select="@ibsident:identCode"/></xsl:attribute>
        <xsl:attribute name="ident:PDLength"><xsl:value-of select="@ibsident:PDLength"/></xsl:attribute>
        <xsl:attribute name="ident:PALength"><xsl:value-of select="@ibsident:PALength"/></xsl:attribute>
        <xsl:attribute name="ident:protocolSpecificName">Ident-Code/PDLength/PALength</xsl:attribute>
    </xsl:element>
</xsl:template>

<!--
device type for PCP and Base Profile Interbus Devices
-->
<xsl:template match="ibdevice:IdTypeID">
    <xsl:param name="value" select="@ibsident:deviceName"/>
    <xsl:element name="IdTypeID">
        <xsl:call-template name="genMatch">
            <xsl:with-param name="value" select="$value"/>
        </xsl:call-template>
        <xsl:attribute name="ident:protocolSpecificName">ProductName</xsl:attribute>
    </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:IdTypeID">
    <xsl:element name="IdTypeID">
        <xsl:attribute name="ident:value"><xsl:value-of select="@ibsident:deviceName"/></xsl:attribute>
        <xsl:attribute name="ident:protocolSpecificName">ProductName</xsl:attribute>
    </xsl:element>
</xsl:template>

<!--
software revision
-->
<xsl:template match="ibdevice:IdSoftwareRevision">
    <xsl:param name="value" select="@ibsident:firmwareRevision"/>
    <xsl:element name="IdSoftwareRevision">
        <xsl:attribute name="ident:protocolSpecificName">FirmwareVersion</xsl:attribute>
        <xsl:call-template name="genMatch">
            <xsl:with-param name="value" select="$value"/>
        </xsl:call-template>
    </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:IdSoftwareRevision">
    <xsl:param name="value" select="@ibsident:firmwareRevision"/>
    <xsl:element name="IdSoftwareRevision">
        <xsl:attribute name="ident:protocolSpecificName">FirmwareVersion</xsl:attribute>
        <xsl:call-template name="genMatch">
            <xsl:with-param name="value" select="$value"/>
        </xsl:call-template>
    </xsl:element>
</xsl:template>

```

```

<!--
hardware revision
-->
<xsl:template match="ibsdevice:IdHardwareRevision">
  <xsl:param name="value" select="@ibsident:hardwareRevision"/>
  <xsl:element name="IdHardwareRevision">
    <xsl:attribute name="ident:protocolSpecificName">HardwareVersion</xsl:attribute>
    <xsl:call-template name="genMatch">
      <xsl:with-param name="value" select="$value"/>
    </xsl:call-template>
  </xsl:element>
</xsl:template>
<xsl:template match="ibsscan:IdHardwareRevision">
  <xsl:param name="value" select="@ibsident:hardwareRevision"/>
  <xsl:element name="IdHardwareRevision">
    <xsl:attribute name="ident:protocolSpecificName">HardwareVersion</xsl:attribute>
    <xsl:call-template name="genMatch">
      <xsl:with-param name="value" select="$value"/>
    </xsl:call-template>
  </xsl:element>
</xsl:template>

<xsl:template name="genIbsMatch">
  <xsl:param name="value1"/>
  <xsl:param name="value2"/>
  <xsl:param name="value3"/>
  <xsl:param name="empty"/>
  <xsl:if test="$value1!=$empty or $value2!=$empty or $value3!=$empty">
    <xsl:attribute name="ident:value"><xsl:value-of select="$value1"/></xsl:attribute>
    <xsl:attribute name="ident:value"><xsl:value-of select="$value2"/></xsl:attribute>
    <xsl:attribute name="ident:value"><xsl:value-of select="$value3"/></xsl:attribute>
  </xsl:if>
  <xsl:apply-templates select="ibsident:RegExpr"/>
</xsl:template>
<!--
generate matching information
-->
<xsl:template name="genMatch">
  <xsl:param name="value"/>
  <xsl:param name="empty"/>
  <xsl:if test="$value!=$empty">
    <xsl:attribute name="ident:value"><xsl:value-of select="$value"/></xsl:attribute>
  </xsl:if>
  <xsl:apply-templates select="ibsident:RegExpr"/>
</xsl:template>
<!--
generate regular expressions
-->
<xsl:template match="ibsident:RegExpr">
  <!-- copy pattern info -->
  <xsl:call-template name="genPattern">
    <xsl:with-param name="match" select="@match"/>
    <xsl:with-param name="nomatch" select="@nomatch"/>
  </xsl:call-template>
</xsl:template>
<!--
generate pattern information
-->
<xsl:template name="genPattern">
  <xsl:param name="match"/>
  <xsl:param name="nomatch"/>
  <xsl:param name="empty"/>
  <xsl:choose>
    <xsl:when test="$match!=$empty">
      <xsl:element name="ident:RegExpr">
        <xsl:attribute name="match"><xsl:value-of select="$match"/></xsl:attribute>
        <xsl:if test="$nomatch!=$empty">
          <xsl:attribute name="nomatch"><xsl:value-of select="$nomatch"/></xsl:attribute>
        </xsl:if>
      </xsl:element>
    </xsl:when>
  </xsl:choose>
</xsl:template>

```

```
<xsl:when test="$nomatch!=empty">
  <xsl:element name="ident:RegExpr">
    <xsl:attribute name="nomatch"><xsl:value-of select="$nomatch"/></xsl:attribute>
    <xsl:if test="$match!=empty">
      <xsl:attribute name="match"><xsl:value-of select="$match"/></xsl:attribute>
    </xsl:if>
  </xsl:element>
</xsl:when>
</xsl:choose>
</xsl:template>
</xsl:transform>
```

Bibliography

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 - [3] IEC 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*
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