Ethernet POWERLINK

XML Device Description – Implementation Guideline

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Vers.	Date	Author		short description
0.0.1	2009-08-13	Thomas Hopfgartner	B&R	Created
0.0.2	2009-10-23	Thomas Hopfgartner	B&R	Inputs after CIA TF XML meeting incorporated
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1.0.1	2023-06-02	Stephan Kirchmayer	B&R	© B&R due to dissolution of EPSG
1.0.2	2024-06-04	Wolfgang Burreiner	B&R	Add information’s about mandatory default value of 0x1018/01 vendor ID

Pre. 4 Content

Pre. 5 Tables

Pre. 6 Figures

Pre. 7 Definitions and Abbreviations

XML Extensible Markup Language

XDD XML – Device Description

XDC XML – Device Configuration

Pre. 8 References

[1] EPSG Draft Standard 301 (EPSG DS 301), Ethernet POWERLINK, Communication Profile Specification

[2] EPSG Draft Standard 311 (EPSG DS 311), Ethernet POWERLINK, XML Device Description

1 Introduction

These implementation guideline corresponds to the specification “EPSG DS 311 V1.0.0”. They provide an overview from of the common use of XML device descriptions for POWERLINK devices. XML Device Descriptions (XDDs) and XML Device Configurations (XDCs) vary in the definition of default values (XDD) and actual values (XDC).

The description is built up as step by step. In the beginning the structure of the file is described, which can be overtaken and edited. Afterwards the most common used things are described. XML Sample parts depicted from the complete XDD file in the end of the document always start with a line number to have a reference for to the complete XDD.

The file shall always be build up as following:

0xVendorID_ProductName.xdd

A Sample is:

0x0100006C_X20BC0083.XDD

2 FileStrucuture

2.1 ProfileContainer

POWERLINK device description / configuration files make use of the multi-profile container specified in ISO 157451:2005/Amd.1 for XML profile files. A valid POWERLINK XML file is defined as shown in Fig. 1

```
001  <?xml version="1.0" encoding="UTF-8" ?>
002  <ISO15745ProfileContainer>
003    xmlns="http://www.ethernet-powerlink.org"
004    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
005    xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
418 </ISO15745ProfileContainer>
```

Fig. 1. File Layout - ISO Container

2.1.1 POWERLINK Profiles

The POWERLINK profiles are placed within the ProfileContainter. The Device Profile describes the device relevant parameters and the Communication Profile describes the communication network relevant parameters of POWERLINK

A sample is given below.

```
001  <?xml version="1.0" encoding="UTF-8" ?>
002  <ISO15745ProfileContainer>
003    xmlns="http://www.ethernet-powerlink.org"
004    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
005    xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
006    <!-- Device Profile POWERLINK-->
007    <ISO15745Profile>
008      <ProfileHeader>
019      </ProfileHeader>
020      <ProfileBody
021        xsi:type="ProfileBody_Device_Powerlink"
165    </ProfileBody>
418  </ISO15745ProfileContainer>
```

Fig. 2. File Layout - POWERLINK Profiles

The distinction between the Device Profile area and the Communication Profile area is done via declaring the type of the ProfileBody element ‘xsi:type="ProfileBody_xxx_Powerlink" ‘.

Profile - Device POWERLINK

The device profile describes the device in detail. The content of this part is completely vendor specific.

2.1.1.1.1 Profile Header

The header shall contain the elements listed below.

Element	Description
ProfileIdentification	The value of this element uniquely identifies the current profile.
ProfileRevision	The value of this element identifies the current profile revision within the XML file.
ProfileName	This element contains a descriptive English name of the current profile. In case that more than one ProfileBody element are present within a device profile, it is suggested that the value of the ProfileName element is given by the concatenation of the values of the productName elements inside the respective DeviceIdentity elements.
ProfileSource	This element identifies the validator of the current profile.
ProfileClassID	This element identifies the class of the current profile according to ISO 15745-1. The element shall contain the value “Device”.
ISO15745Reference	This element states the ISO 15745 part, edition and technology, to which the description conforms. This is a fixed value and can be taken from the sample in Fig. 3..

Tab. 1 File Layout – Profile Header Elements

The ISO15745ProfileContainer is describing the references needed for describing an XML. This can be taken as shown in the sample below one by one.

A sample is given below.

```
001  <?xml version="1.0" encoding="UTF-8" ?>
002  <ISO15745ProfileContainer>
003    xmlns="http://www.ethernet-powerlink.org"
004    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
005    xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
006    <!-- Device Profile POWERLINK-->
007    <ISO15745Profile>
008      <ProfileHeader>
009        <ProfileIdentification>EPL_Device_Profile_name</ProfileIdentification>
010        <ProfileRevision>1</ProfileRevision>
011        <ProfileName>Ethernet POWERLINK MyName device profile</ProfileName>
012        <ProfileSource/>
013        <ProfileClassID>Device</ProfileClassID>
014        <ISO15745Reference>
015          <ISO15745Part>4</ISO15745Part>
016          <ISO15745Edition>1</ISO15745Edition>
```

```
017          <ProfileTechnology>Powerlink</ProfileTechnology>
018       </ISO15745Reference>
019       </ProfileHeader>
020       <ProfileBody
021         xsi:type="ProfileBody_Device_Powerlink"
165     </ProfileBody>
418   </ISO15745ProfileContainer>
```

Fig. 3. File Layout - Device Profile Header

2.1.1.1.2 Profile Body

The Profile body itself contains the following attributes in Tab. 1.

Attribute	Datatype	Use	Description
fileName	xsd:string	required	Name of the file with extension (.xdd or .xdc)
fileCreator	xsd:string	required	Person creating the file
fileCreationDate	xsd:date	required	Date of file creation
fileCreationTime	xsd:time	optional	Time of file creation
fileModifiedBy	xsd:string	optional	Person last modifiying the file
fileModificationDate	xsd:date	optional	Date of last file change
fileModificationTime	xsd:time	optional	Time of last file change
fileVersion	xsd:string	required	Vendor specific version of the file
supportedLanguages	xsd:NMTOKENS	optional	List of supported languages
deviceClass	xsd:NMTOKEN	optional	Classification of the device profile; valid Values: compact (the profile is complete and unique for a product or product family) configurable (open configurable product that needs an external configuration tool to create the profile of one instance)

Tab. 2 File Layout - Profile Body Elements

2.1.1.1.2.1 Device Identity

The DeviceIdentity element contains elements, which are independent of the network and of the device. It describes the identity of a single device or a group of devices.

Element	Description
vendorName	The vendorName element identifies the name or the brand name of the device vendor. The vendor name registered at CiA (CAN in Automation) shall be used. (Use the company name, if not registered.)
vendorID	The vendorID element identifies the vendor. The vendor ID assigned from CiA shall be used. (Use 0, if no ID has been assigned.)
vendorText	The vendorText element allows the vendor to provide additional company information, like address or hotline number.
deviceFamily	The deviceFamily element states the family of the device. Examples for deviceFamily are: - Variable Speed Drive - Circuit Breaker - Pressure Sensor
productFamily	The productFamily element contains a vendor specific affiliation of the device type to a certain set of devices inside a family. The list of valid productFamily values is system, tool or consortia specific. Examples for productFamily: - I/O System

productName	The productName element describes the name of the product as it's known by the vendor. For example the sales product number from the device can be taken.
productID	The productID element describes a vendor specific unique identification for the device. For example the vendors internal ID for handling in the system can be taken.
productText	The productText element allows the vendor to provide a short textual description of the device type. Example - Modular I/O System IP67 based
orderNumber	The orderNumber element is used to store the single order number of a given device or the set of different order numbers of the products of a device family, depending upon whether the device profile describes a product or a device family.
version	The version element is used to store different types of version information. Multiple version elements are possible. Types of versions: SW – Software FW – Firmware HW - Hardware

Tab. 3 File Layout – Device Identity Elements

A sample is given below.

```
001  <?xml version="1.0" encoding="UTF-8" ?>
002  <ISO15745ProfileContainer>
003    xmlns="http://www.ethernet-powerlink.org"
004    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
005    xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
006    <!-- Device Profile POWERLINK-->
007    <ISO15745Profile>
019      <ProfileHeader/>
020      <ProfileBody
021        xsi:type="ProfileBody_Device_Powerlink"
022        fileName="filename"
023        fileCreator="creator_name"
024        fileCreationDate="2006-07-10"
025        fileCreationTime="15:00:00+01:00"
026        fileModificationDate="2007-06-18"
027        fileModificationTime="15:20:00+01:00"
028        fileModifiedBy="modifier_name"
029        fileVersion="00.01"
030        supportedLanguages="en">
031        <DeviceIdentity>
032          <vendorName>vendor_name</vendorName>
```

```
033           <vendorID>0x12345678</vendorID>
034           <vendorText>
035             <label lang="en">Experiencing problems - contact our support : +1</label>
036           </vendorText>
037           <deviceFamily>
038             <label lang="en">Modular I/O system</label>
039           </deviceFamily>
040           <productName>MyName</productName>
041           <productID>1234</productID>
042           <productText>
043             <label lang="en">POWERLINK Dummy I/O device</label>
044           </productText>
045           <orderNumber>order_text</orderNumber>
046           <version versionType="HW">1</version>
047           <version versionType="FW">1</version>
048           <version versionType="SW">1</version>
049         </DeviceIdentity>
050         <DeviceFunction>
051           <capabilities>
052             <characteristicsList>
053               <characteristic>
054                 <characteristicName>
055                   <label lang="en">Operational voltages</label>
056                 </characteristicName>
057                 <characteristicContent>
058                   <label lang="en">12 V</label>
059                 </characteristicContent>
060                 <characteristicContent>
061                   <label lang="en">24 V</label>
062                 </characteristicContent>
063                 </characteristic>
064                 <characteristic>
065                 <characteristicName>
066                   <label lang="en">Transfer rate</label>
067                 </characteristicName>
068                 <characteristicContent>
069                   <label lang="en">100 MBit/s</label>
070                 </characteristicContent>
071               </characteristic>
072               <characteristic>
073                 <characteristicName>
074                   <label lang="en">Mounting orientation</label>
075                 </characteristicName>
076                 <characteristicContent>
077                   <label lang="en">Horizontal</label>
078                 </characteristicContent>
079                 <characteristicContent>
080                   <label lang="en">Vertical</label>
081                 </characteristicContent>
082               </characteristic>
083             </characteristicsList>
084           </capabilities>
085         </DeviceFunction>
165     </ProfileBody>
166     </ISO15745Profile>
167     <!-- Communication Profile POWERLINK-->
168     <ISO15745Profile>
169       <ProfileHeader/>
181        <ProfileBody
182          xsi:type="ProfileBody_CommunicationNetwork_Powerlink"/>
417     </ISO15745Profile>
418   </ISO15745ProfileContainer>
```

Fig. 4. File Layout - Device Profile Body

2.1.1.1.2.2 DeviceFunction

The DeviceFunction element defines the catalogue view of the device, presented as a set of capabilities listing device characteristics.

Element	Description
capabilities	The mandatory capabilities element textually describes all functionalities, their characteristics, and the important parameters of the device, that need to be known by tools which use the device profile to select products with the same or similar properties in purely text.
characteristicsList	The characteristicsList element is a collection of characteristics. The element shall contain at least one characteristic sub-element.
characteristic	The characteristic element describes a single characteristic of a device. It contains a mandatory characteristicName element and at least one to many characteristicContent elements.
characteristicName	The mandatory characteristicName element denotes a major technical characteristic of the device. Examples are: "Maximum operational voltage", "Overload protection", "Electrical durability".
characteristicContent	This mandatory element contains a value for the characteristic. Multiple values may be expressed by using multiple characteristicContent elements. EXAMPLE An example of a single value for "Maximum operational voltage" would be 680V.

Tab. 4 File Layout – Device Function Elements

A sample is given below.

```
001  <?xml version="1.0" encoding="UTF-8" ?>
002  <ISO15745ProfileContainer>
003    xmlns="http://www.ethernet-powerlink.org"
004    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
005    xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
006    <!-- Device Profile POWERLINK-->
007    <ISO15745Profile>
019      <ProfileHeader/>
020      <ProfileBody
```

```
021        xsi:type="ProfileBody_Device_Powerlink"
022        fileName="filename"
023        fileCreator="creator_name"
024        fileCreationDate="2006-07-10"
025        fileCreationTime="15:00:00+01:00"
026        fileModificationDate="2007-06-18"
027        fileModificationTime="15:20:00+01:00"
028        fileModifiedBy="modifier_name"
029        fileVersion="00.01"
030        supportedLanguages="en">
049        <DeviceIdentity/>
050        <DeviceFunction>
051          <capabilities>
052            <characteristicsList>
053              <characteristic>
054                <characteristicName>
055                  <label lang="en">Operational voltages</label>
056                </characteristicName>
057                <characteristicContent>
058                  <label lang="en">12 V</label>
059                </characteristicContent>
060                <characteristicContent>
061                  <label lang="en">24 V</label>
062                </characteristicContent>
063                </characteristic>
064                <characteristic>
065                <characteristicName>
066                  <label lang="en">Transfer rate</label>
067                </characteristicName>
068                <characteristicContent>
069                  <label lang="en">100 MBit/s</label>
070                </characteristicContent>
071              </characteristic>
072              <characteristic>
073                <characteristicName>
074                  <label lang="en">Mounting orientation</label>
075                </characteristicName>
076                <characteristicContent>
077                  <label lang="en">Horizontal</label>
078                </characteristicContent>
079                <characteristicContent>
080                  <label lang="en">Vertical</label>
081                </characteristicContent>
082              </characteristic>
083            </characteristicsList>
084          </capabilities>
085        </DeviceFunction>
164      <ApplicationProcess/>
165    </ProfileBody>
166    </ISO15745Profile>
167    <!-- Communication Profile POWERLINK-->
168    <ISO15745Profile>
180      <ProfileHeader/>
416      <ProfileBody/>
417    </ISO15745Profile>
418  </ISO15745ProfileContainer>
```

Fig. 5. File Layout - Device Profile Body

2.1.1.1.2.3 Application Process

This element is described in chapter 6.

Profile – Communication POWERLINK

The ProfileHeader including all sub-elements and the attributes of the ProfileBody of the Communication POWERLINK profile are similar to their counterparts in the Device POWERLINK profile. They shall contain the same values.

2.1.1.1.3 Profile Header

This element is described in chapter 2.1.1.1.1 and can be reused one by one.

A sample is given below.

```
001  <?xml version="1.0" encoding="UTF-8" ?>
002  <ISO15745ProfileContainer>
003    xmlns="http://www.ethernet-powerlink.org"
004    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
005    xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
006    <!-- Device Profile POWERLINK-->
007    <ISO15745Profile>
009      <ProfileHeader/>
165    <ProfileBody/>
166    </ISO15745Profile>
167    <!-- Communication Profile POWERLINK-->
168    <ISO15745Profile>
169      <ProfileHeader>
170        <ProfileIdentification>EPL_Device_Profile_name</ProfileIdentification>
171        <ProfileRevision>1</ProfileRevision>
172        <ProfileName>ETHERNET Powerlink name device profile</ProfileName>
173        <ProfileSource/>
174        <ProfileClassID>CommunicationNetwork</ProfileClassID>
175        <ISO15745Reference>
176          <ISO15745Part>4</ISO15745Part>
177          <ISO15745Edition>1</ISO15745Edition>
178          <ProfileTechnology>Powerlink</ProfileTechnology>
179        </ISO15745Reference>
180      </ProfileHeader>
181       <ProfileBody
182        xsi:type="ProfileBody_CommunicationNetwork_Powerlink"
183        fileName="filename"
184        fileCreator="creator_name"
185        fileCreationDate="2006-07-10"
186        fileCreationTime="15:00:00+01:00"
187        fileModificationDate="2007-06-18"
188        fileModificationTime="15:20:00+01:00"
189        fileModifiedBy="modifier_name"
190        fileVersion="00.01"
191        supportedLanguages="en"/>
416      </ProfileBody>
417    </ISO15745Profile>
418  </ISO15745ProfileContainer>
```

Fig. 6. File Layout - Communication Profile Header

2.1.1.1.4 Profile Body

This attributes of this element are described in chapter 2.1.1.1.2.

2.1.1.1.4.1 Application Layers

The ApplicationLayers element represents the POWERLINK application layer. It gives detailed information about the ObjectList of a device. The ObjectList is described in chapter 3.

2.1.1.1.4.1.1 identity

Since different communication profiles may require different identity information, an optional local identity sub-element may be used within an ApplicationLayers element. This identity element may contain a subset of the sub-elements of the DeviceIdentity element. All sub-element descriptions given there also apply for the sub-elements of this identity element.

Element	Description
vendorID	The vendorID element identifies the vendor by an ID. The vendor ID assigned from CiA shall be used. (Use 0, if no ID has been assigned.)
productID	The productID element describes a vendor specific unique identification of the device. For example the vendors internal ID for handling in the system can be taken.
version	The version element is used to store different types of version information. Multiple version elements are possible. Types of version: - SW = Software - FW = Firmware - HW = Hardware

Tab. 5 File Layout – identity Elements

A sample is given below.

```
001  <?xml version="1.0" encoding="UTF-8" ?>
002  <ISO15745ProfileContainer>
003    xmlns="http://www.ethernet-powerlink.org"
```

```
004    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
005    xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
006    <!-- Device Profile POWERLINK-->
007    <ISO15745Profile>
019      <ProfileHeader/>
165      <ProfileBody/>
166    </ISO15745Profile>
167    <!-- Communication Profile POWERLINK-->
168    <ISO15745Profile>
180      <ProfileHeader/>
181      <ProfileBody
182        xsi:type="ProfileBody_CommunicationNetwork_Powerlink"
183        fileName="filename"
184        fileCreator="creator_name"
185        fileCreationDate="2006-07-10"
186        fileCreationTime="15:00:00+01:00"
187        fileModificationDate="2007-06-18"
188        fileModificationTime="15:20:00+01:00"
189        fileModifiedBy="modifier_name"
190        fileVersion="00.01"
191        supportedLanguages="en">
192        <ApplicationLayers>
193          <identity>
194            <vendorID>0x12345678</vendorID>
195            <productID>1234</productID>
196            <version versionType="HW">1</version>
197            <version versionType="FW">1</version>
198            <version versionType="SW">1</version>
199          </identity>
399        </ApplicationLayers>
400        <TransportLayers/>
415        <NetworkManagement/>
416      </ProfileBody>
417    </ISO15745Profile>
418  </ISO15745ProfileContainer>
```

Fig. 7. File Layout - identity

2.1.1.1.4.1.2 DataTypeList

Data types in ObjectList are given in hexadecimal number (as defined in the POWERLINK Specification).

The element DataTypeList stores a hex to data type relation for tool implementations.

For each data type DataTypeList contains a sub-element.

A sample is given below.

```
200          <DataTypeList>
201            <defType dataType="0001"><Boolean/></defType>
202            <defType dataType="0002"><Integer8/></defType>
203            <defType dataType="0003"><Integer16/></defType>
204            <defType dataType="0004"><Integer32/></defType>
205            <defType dataType="0005"><Unsigned8/></defType>
206            <defType dataType="0006"><Unsigned16/></defType>
207            <defType dataType="0007"><Unsigned32/></defType>
208            <defType dataType="0008"><Real32/></defType>
209            <defType dataType="0009"><Visible_String/></defType>
210            <defType dataType="0010"><Integer24/></defType>
211            <defType dataType="0011"><Real64/></defType>
212            <defType dataType="0012"><Integer40/></defType>
```

```
213             <defType dataType="0013"><Integer48/></defType>
214             <defType dataType="0014"><Integer56/></defType>
215             <defType dataType="0015"><Integer64/></defType>
216             <defType dataType="000A"><Octet_String/></defType>
217             <defType dataType="000B"><Unicode_String/></defType>
218             <defType dataType="000C"><Time_of_Day/></defType>
219             <defType dataType="000D"><Time_Diff/></defType>
220             <defType dataType="000F"><Domain/></defType>
221             <defType dataType="0016"><Unsigned24/></defType>
222             <defType dataType="0018"><Unsigned40/></defType>
223             <defType dataType="0019"><Unsigned48/></defType>
224             <defType dataType="001A"><Unsigned56/></defType>
225             <defType dataType="001B"><Unsigned64/></defType>
226             <defType dataType="0401"><MAC_ADDRESS/></defType>
227             <defType dataType="0402"><IP_ADDRESS/></defType>
228             <defType dataType="0403"><NETTIME/></defType>
229           </DataTypeList>
```

Fig. 8. File Layout – DataTypeList

2.1.1.1.4.1.3 ObjectList

This part is described in chapter 3.

2.1.1.1.4.2 TransportLayers

The TransportLayers element is existing for compatibility to the CANopen XML device description and is mandatory. For POWERLINK this element is empty.

2.1.1.1.4.3 Network Management

This part is described in chapter 4.

3 Object List

The ObjectList contains the definition of the Object Dictionary of a device. It consists of Object elements which can contain up to 254 SubObject elements.

The ObjectList element contains the attributes given in following Table.

Attribute	Data type	Use	Description
mandatoryObjects	xsd:unsignedInt	optional	Number of mandatory objects in the dictionary; Communication related objects 1000h – 1FFFh
optionalObjects	xsd:unsignedInt	optional	Number of optional objects in the dictionary; Communication related and user related objects 1000h – FFFFh
manufacturerObjects	xsd:unsignedInt	optional	Number of manufacturer-defined objects in the dictionary 2000h – 5FFFh and C000h – FFFFh

Tab. 6 ObjectList – Attributes of ObjectList

3.1 Object

The element can contain zero to 254 SubObject elements. The Object element and the SubObject element map the functional part of the POWERLINK device profile to the POWERLINK communication network profile.

The Object element contains the attributes given in the following table.

Attribute	Data type	Use	Description
index	xsd:hexBinary	required	Index of the object (four hex digits)
name	xsd:string	required	Name of the object
objectType	xsd:unsigenedByte	required	One of the following POWERLINK object types: "7" - VAR "8" - ARRAY "9" - RECORD
dataType	xsd:hexBinary	optional	POWERLINK data type (four hex digits). See chapter 2.1.1.2.2.1.5
lowLimit	xsd:string	optional	Low limit of the parameter value
highLimit	xsd:string	optional	High limit of the parameter value
accessType	xsd:string	optional	Access type of the object; Valid values are: const – read only access; the value is not changing ro – read only access wo – write only access rw – both read and write access
defaultValue	xsd:string	optional	Default value of the object

actualValue	xsd:string	optional	Actual value of the object. XDD files does not contain this value. User inputs and actual configured values are considered in this attribute. If the attribute *actualValue* is used the file has to be stored as a .xdc
denotation	xsd:string	optional	Application specific name of the object. Used by tools for application specific object naming (e.g. pressure, velocity). If the attribute denotation is used the file has to be stored as a .xdc (XML device configuration file).
PDOmapping	xsd:NMTTOKEN	optional	described in chapter 4
objFlags	xsd:hexBinary	optional	described in chapter 3.3
uniqueIDRef	xsd:IDREF	optional	described in chapter 3.6
subNumber	xsd:unsignedByte	optional	Number of sub-objects of the object

Tab. 7 ObjectList – Object Element Attributes

A list of mandatory Objects is given below.

```
230          <ObjectList>
231            <!-- mandatory Objects -->
232            <Object index="1000" name="NMT_DeviceType_U32" objectType="7"/>
233            <Object index="1001" name="ERR_ErrorRegister_U8" objectType="7"/>
234            <Object index="1006" name="NMT_CycleLen_U32" objectType="7"/>
235            <Object index="1018" name="NMT_IdentityObject_REC" objectType="9">
236              <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="4"/>
237              <SubObject subIndex="01" name="VendorId_U32" objectType="7
                  defaultValue=”0x00000000"/>
238              <SubObject subIndex="02" name="ProductCode_U32" objectType="7"/>
239              <SubObject subIndex="03" name="RevisionNo_U32" objectType="7"/>
240              <SubObject subIndex="04" name="SerialNo_U32" objectType="7"/>
241            </Object>
242            <Object index="1020" name="CFM_VerifyConfiguration_REC" objectType="9">
243              <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="2"/>
244              <SubObject subIndex="01" name="ConfDate_U32" objectType="7"/>
245              <SubObject subIndex="02" name="ConfTime_U32" objectType="7"/>
246            </Object>
247            <Object index="1030" name="NMT_InterfaceGroup_0h_REC" objectType="9">
248              <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="9"/>
249              <SubObject subIndex="01" name="InterfaceIndex_U16" objectType="7"/>
250              <SubObject subIndex="02" name="InterfaceDescription_VSTR" objectType="7"/>
251              <SubObject subIndex="03" name="InterfaceType_U8" objectType="7"/>
252              <SubObject subIndex="04" name="InterfaceMtu_U16" objectType="7"/>
253              <SubObject subIndex="05" name="InterfacePhysAddress_OSTR" objectType="7"/>
254              <SubObject subIndex="06" name="InterfaceName_VSTR" objectType="7"/>
255              <SubObject subIndex="07" name="InterfaceOperStatus_U8" objectType="7"/>
```

```
256             <SubObject subIndex="08" name="InterfaceAdminState_U8" objectType="7"/>
257             <SubObject subIndex="09" name="Valid_BOOL" objectType="7" objectType="7"/>
258           </Object>
259           <Object index="1300" name="SDO_SequLayerTimeout_U32" objectType="7"/>
260           <Object index="1C0B" name="DLL_CNLossSoC_REC" objectType="9">
261             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="3"/>
262             <SubObject subIndex="01" name="CumulativeCnt_U32" objectType="7"/>
263             <SubObject subIndex="02" name="ThresholdCnt_U32" objectType="7"/>
264            <SubObject subIndex="03" name="Threshold_U32" objectType="7"/>
265          </Object>
266          <Object index="1C0F" name="DLL_CNCRCError_REC" objectType="9">
267            <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="3"/>
268             <SubObject subIndex="01" name="CumulativeCnt_U32" objectType="7"/>
269             <SubObject subIndex="02" name="ThresholdCnt_U32" objectType="7"/>
270             <SubObject subIndex="03" name="Threshold_U32" objectType="7"/>
271           </Object>
272           <Object index="1C14" name="DLL_CNLossOfSocTolerance_U32" objectType="7"/>
273           <Object index="1F82" name="NMT_FeatureFlags_U32" objectType="7"/>
274           <Object index="1F83" name="NMT_EPLVersion_U8" objectType="7"/>
275           <Object index="1F8C" name="NMT_CurrNMTState_U8" objectType="7"/>
276           <Object index="1F93" name="NMT_EPLNodeID_REC" objectType="9">
277             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="2"/>
278             <SubObject subIndex="01" name="NodeID_U8" objectType="7"/>
279             <SubObject subIndex="02" name="NodeIDByHW_BOOL" objectType="7"/>
280           </Object>
281           <Object index="1F98" name="NMT_CycleTiming_REC" objectType="9">
282             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="8"/>
283             <SubObject subIndex="01" name="IsochrTxMaxPayload_U16" objectType="7"/>
284             <SubObject subIndex="02" name="IsochrRxMaxPayload_U16" objectType="7"/>
285             <SubObject subIndex="03" name="PResMaxLatency_U32" objectType="7"/>
286             <SubObject subIndex="04" name="PReqActPayload_U16" objectType="7"/>
287             <SubObject subIndex="05" name="PResActPayload_U16" objectType="7"/>
288             <SubObject subIndex="06" name="ASndMaxLatency_U32" objectType="7"/>
289             <SubObject subIndex="07" name="MultiplCycleCnt_U8" objectType="7"/>
290             <SubObject subIndex="08" name="AsyncMTUSize_U16" objectType="7"/>
291           </Object>
292           <Object index="1F99" name="NMT_CNBasicEthernetTimeout_U32" objectType="7"/>
293           <Object index="1F9E" name="NMT_ResetCmd_U8" objectType="7"/>
398         </ObjectList>
```

Fig. 9. ObjectList – Mandatory Indices

3.1.1 Vendor ID Default Value

To ensure consistency and ease of configuration, the VendorId_U32 (SubObject 01 of the 1018 Object) must have a defaultValue that matches the vendor ID of the device. This guarantees that each device's identity is correctly initialized with the appropriate vendor-specific information. In the list of mandatory objects above, you can see an example value "0x00000000". Please replace this value with the defaultValue that matches your device's vendor ID.

3.2 SubObject

The SubObject element has an empty content and contains the attributes given in following Table.

Attribute	Data type	Use	Description
subIndex	xsd:hexBinary	required	Index of the sub-object (four hex digits)
name	xsd:string	required	Name of the sub-object
objectType	xsd:unsigenedByte	required	The following POWERLINK object type is allowed: "7" – VAR shall be used
dataType	xsd:hexBinary	optional	POWERLINK data type (four hex digits). See chapter 2.1.1.2.2.1.5
lowLimit	xsd:string	optional	Low limit of the parameter value
highLimit	xsd:string	optional	High limit of the parameter value
accessType	xsd:string	optional	Access type of the sub-object; Valid values are: const – read only access; the value is not changing ro – read only access wo – write only access rw – both read and write access
defaultValue	xsd:string	optional	Default Value of the object
actualValue	xsd:string	optional	Actual value of the sub-object. If the attribute *actualValue* is used the file has to be stored as .xdc

denotation	xsd:string	optional	Application specific name of the sub-object. Used by tools for application specific sub-object naming (e.g. pressure, velocity). If this attribute is used the file has to be stored as .xdc.
PDOmapping	xsd:NMTTOKEN	optional	further described in chapter 5
objFlags	xsd:hexBinary	optional	further described in chapter 3.3
uniqueIDRef	xsd:IDREF	optional	further described in chapter 6

3.3 objFlags

The purpose of objFlags is to control the behaviour of tools. E.g. writing a value to an object can have a direct influence like changing the direction of a motor. To prevent this the object flag “write on download not allowed” can be set.

It is a four hex digits value and defined as following:

bit 0: 0 – write on download allowed

1 – write on download not allowed

bit 1: 0 – read on upload allowed

1 – read on upload not allowed

bit 2: 0 – change of value takes effect immediately

1 – change takes effect after reset

bit 3 to 31: reserved (0)

3.4 Store Configuration

If a device is able to store parameters, the associated Object 1010h shall exist within the Object list.

By including this object into the XML file tools and their runtime environment have the possibility to store the parameters on the device.

A sample is given below.

```
302           <Object index="1010" name="NMT_StoreParam_REC" objectType="9">
303             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" dataType="0005"
304                        accessType="const" defaultValue="0x1" PDOmapping="no" />
305             <SubObject subIndex="01" name="AllParam_U32" objectType="7" dataType="0007"
306                        accessType="rw" defaultValue="0" PDOmapping="no" />
307           </Object>
```

Fig. 10. ObjectList – Store Configuration

3.5 Records

Records are objects which can contain subObjects of different data types than the object. Records shall be fully described with all their valid subObjects and only the subObjects can be referenced within the application process. (See chapter 6)

3.6 uniqueIDRef

The uniqueIDRef attribute links the object or sub-object to an appropriate parameter definition in the application process part (see chapter 6). This parameter is identified via a uniqueID containing the same value as the uniqueIDRef element of the object / sub-object.

If the attribute is present, the attributes datatype, lowLimit, highLimit, accessType, and defaultValue shall be defined by the referenced element in the application process part. These attributes of Object/SubObject are ignored by tools and can be omitted.

A Sample for an Object List entry referencing to the application process is given below.

```
230         <ObjectList>
              ...
383           <Object index="2001" name="NonMapableExample2_U8" objectType="7" PDOmapping="no"
384                   uniqueIDRef="UID_2"/>
              ...
398         </ObjectList>
```

Fig. 11. Object List – uniqueIDRef

4 Mapping

There are three different types of mapping for devices which are listed in the following table.

Type	Description
default mapping	This mapping represents the factory settings. Always present after a NMTReset and can not be changed from the user.
static mapping	Userdefined CN – mapping which is fixed from CN side and can't be changed from MN side. Described in chapter 4.1.
dynamic mapping	Fully flexible mapping to the CN which can be performed from MN side. Describe in chapter 4.2.

Tab. 8 Static Mapping – Mapping types

4.1 Static mapping

To describe a complete static mapping for a device, several conditions need to be fulfilled. These conditions are listed below.

Condition 1

The object 1F82h contains the feature flags of a CN. Bit 6 describes the support of “Dynamic PDO Mapping” which need to be FALSE meaning that the device does not support dynamic mapping.

A sample is given below.

```
273  <Object index="1F82" name="NMT_FeatureFlags_U32" objectType="7"
            value="0607"   />
```

Tab. 9 Static Mapping – NMT_FeatureFlags_U32

Condition 2

If 1400h and/or 1800h is/are existing, Sub-object 2 of this index is describing the mapping version. The value of the attribute *“accessType”* of Sub-object 2 needs to be *“ro”*.

A sample is given below.

```
312  <Object index="1800" name="PDO_TxCommParam_0h_REC" objectType="9">
313    <SubObject subIndex="00" name="NumberOfEntries" objectType="7" dataType="0005"
314               accessType="ro" defaultValue="0x2" PDOmapping="no" />
315    <SubObject subIndex="01" name="NodeID_U8" objectType="7" dataType="0005"
316               accessType="rw" defaultValue="0x0" PDOmapping="no" />
317    <SubObject subIndex="02" name="MappingVersion_U8" objectType="7" dataType="0005"
318               accessType="ro" defaultValue="0x0" PDOmapping="no" />
319 </Object>
```

Tab. 10 Static Mapping – MappingVersion_U8

Condition 3

If object 1400h is existing the corresponding object 1600h shall to exist as well. Same is valid for 1800h and 1A00h.

Condition 4

Each Sub-object of object index 1600h or 1A00h shall have a further entry within the ObjectList, describing the mapped (sub)-object in detail.

A sample is given below.

```
319  <Object index="1A00" name="PDO_TxMappParam_0h_AU64" objectType="8">
320    <SubObject subIndex="00" name="NumberOfEntries" objectType="7" dataType="0005"
321               accessType="ro" defaultValue="0x0A" PDOmapping="no" />
322    <SubObject subIndex="01" name="ObjectMapping 1" objectType="7" dataType="001B"
323               accessType="ro" defaultValue="0x0010000000003000" PDOmapping="no" />
342  </Object>

344  <Object index="3000" name="Status" objectType="7" PDOmapping="default"
345          accessType="ro" dataType="0006" defaultValue="0x00" />
```

Tab. 11 Static Mapping – Reference Object

Condition 5

All objects and sub-objects with indexes greater or equal 2000h need to have the attribute “PDOmapping=default” or “PDOmapping=no”.

4.2 Dynamic Mapping

There are different possibilities for mapping objects as PDO:

- no – not mappable to PDO data
- default – mapped by default (described in chapter 4.1)
- optional – can be mapped either as transmit or receive PDO
- TPDO – can only be mapped as transmit PDO
- RPDO – can only be mapped as receive PDO

5 Network Management

Device information not covered by mandatory objects is stored in subelements of the NetworkManagement element.

They are separated as following:

Features (mandatory)	Features are called device description entries in the POWERLINK specification. Refer to the POWERLINK specification for a comprehensive list. The features are further grouped in general, MN, and CN features.
deviceCommissioning (optional)	Used by tools to store additional commissioning information (.xdc only)
Diagnostics (optional)	Description of diagnostics data (errors) reported by the device

5.1 Features

Every feature is assigned to GeneralFeatures, MNFeatures or CNFeatures according to its availability on an MN, CN or both. The GeneralFeatures sub-element is mandatory whereas MNFeatures and CNFeatures are optional. In a device description for a CN the element CNFeatures has to be present. Similar a device description for an MN shall contain the element MN Features

The elements GeneralFeatues, MNFeatures or CNFeatures have empty content.

The features are described as attributes of GeneralFeatures, MNFeatures or CNFeatures. The data type of a feature is derived from the data type defined in the POWERLINK Specification and converted to an XML data type. For a list and description of all POWERLINK Features please refer to the device description entries in the POWERLINK specification.

5.1.1 GeneralFeatures

The element GeneralFeatures is mandatory.

A sample of General Features is given below:

```
<GeneralFeatures
 DLLFeatureMN="false"
 NMTBootTimeNotActive="4000"
 NMTCycleTimeMax="60000"
 NMTCycleTimeMin="200"
 NMTErrorEntries="2"
 NWLIPSupport="false"
 SDOServer="true"
 SDOMaxConnections="1"
 SDOMaxParallelConnections="1"/>
```

Fig. 12. Network Management – General Features

Feature	Description
DLLFeatureMN	Indicates if the XDD file is either for a MN or a CN whereby *"false"* is the indication that it is for a CN. In case a device support both there need to be 2 XML Files existing for every type (MN,CN) one
NMTBootTimeNotActive	Represents the boot time (in microseconds) of the device from power on to NMT_MS_NOT_ACTIVE. It is possible to use this value to configure the MN properly waiting for the boot-up of the CN to. It influences directly the boot up time of complete systems.
NMTCycleTimeMax	Is the maximum cycle time in microseconds the device supports.
NMTCycleTimeMin	Is the minimum cycle time in microseconds the device supports
NMTErrorEntries	Gives the maximum number of error entries (status and history entries) which can be sent in the StatusResponse frame.
NWLIPSupport	Ability of the node to communicate via IP. If "true" tools can use this to configure the MN to set the correct parameters to the CN to communicate via IP. (e.g.: set IP gateway)
SDOServer	Determines whether the device has got an SDOServer implementend or not.
SDOMaxConnections	Describes the maximum number of SDO connections.
SDOMaxParallelConnections	Describes the maximum number of active SDO connections between an SDO client/server pair.

Tab. 12 Network Management – MNFeatures

5.1.2 CN Features

In case the XDD file is describing a CN these features are mandatory.

A sample of CN Features is given below:

```
412  <CNFeatures
413   DLLCNFeatureMultiplex="true"
414   NMTCNSoC2PReq="0"/>
```

Fig. 13. Network Management – CN Features

Feature	Description
DLLCNFeatureMultiplex	Node's ability to perform control of multiplexed isochronous communication. Tools can use this to allow configuration of multiplexed from MN side.
NMTSoC2PReq	Time in nanoseconds to handle a PReq following an SoC. It is to consider, that this time is not exceeding the Minimum possible cycle time.

Tab. 13 Network Management – CNFeatures

6 Application Process

The ApplicationProcess element respresents the set of services and parameters, which constitute the behaviour and the interfaces of the the device in terms of the application, independent of the device technology and the underlaying communication networks and communication protocols.

The application process consists of the following elements.

- parameterList (see chapter 6.1)
- templateList (see chapter 6.2)
- datatypeList (see chapter 6.3)

6.1 parameterList

The parameterList is mandatory within the application process and represents a sequence of one to many parameter elements.

Each of the parameter elements represents a parameter of the device profile.

A parameter is described by:

its name(s) and description(s)

its attributes

a choice of possible references

a reference to a simple data type

a reference to a complex data type

a possible empty set of sub-elements(conditionalSupport, denotation, actualValue, defaultValue, substituteValue, allowedValues, unit and property)

6.1.1 parameter

The used elements of a parameter with their functionality are described in the further sub-chapters.

The parameter element shall contain the attributes given in the following Tab.

Attribute	Data type	Use	Description
uniqueID	XSD:ID	required	Unique ID of parameter. Described in 6.1.1.2.

access	XSD:NMTTOKEN	default	Defines which operations are valid for the parameter: const – read access only; the value is not changed read – read access only (default value) write – write access only readWrite – read and write access readWriteInput – both read and write access, but represents process input data readWriteOutput – both read and write access, but represents process output data noAccess – access denied
persistent	xsd:Boolean	default	Defines the behaviour after a power failure; valid values are false (default) and true
offset	xsd:string	optional	further described in chapter 6.1.1.5
multiplier	xsd:string	optional	further described in chapter 6.1.1.5
templateIDRef	xsd:IDREF	optional	further described in chapter 6.1.1.7

Tab. 14 Application Process – Parameter attributes of element parameter

A sample is given below.

```
086  <ApplicationProcess>
125    <parameterList>
126      <parameter uniqueID="UID_1" access="readWrite">
127        <label lang="en">NonMapableExample_U8</label>
128        <USINT/>
143      </parameter>
163    </parameterList>
164  </ApplicationProcess>
```

Fig. 14. Application Process - Parameter

DataTypes

Datatypes are described with an element from the group g_Simple. g_Simple defines a ceratin set of datatypes. The following table is making a comparison between the g_Simple group, EPSG and IEC 61131-3 datatypes.

g_simple	EPSG	EPSG Code (2 Byte hex)	IEC 61131-3
BOOL	BOOLEAN	0001	BOOL
SINT	INTEGER8	0002	SINT
INT	INTEGER16	0003	INT
DINT	INTEGER32	0004	DINT
LINT	INTEGER64	0015	LINT
USINT	UNSIGNED8	0005	USINT
UINT	UNSIGNED16	0006	UINT
UDINT	UNSIGNED32	0007	UDINT
ULINT	UNSIGNED64	001B	ULINT
REAL	REAL32	0008	REAL
LREAL	REAL64	0011	LREAL
STRING	VISIBLE_STRING	0009	STRING
BYTE	UNSIGNED8	0005	BYTE
WORD	UNSIGNED16	0006	WORD
DWORD	UNSIGNED32	0007	DWORD
LWORD	UNSIGNED64	001B	LWORD
BITSTRING	-	-	-
CHAR	VISIBLE_STRING	0009	STRING[1]

Tab. 15 Application Process – Datatype comparison

uniqueID

An element can have an attribute uniqueID which shall be unique within the whole XML file. Referencing with a uniqueIDRef from an Object/Subobject within the ObjectList or from the application process itself is resulting in a uniqueID within the application process.

A sample is given below.

ObjectList

```
230  <ObjectList>
381    <Object index="2000" name="NonMapableExample_U8" objectType="7" PDOmapping="no"
382            uniqueIDRef="UID_1"/>
398  </ObjectList>
```

Application Process

```
086  <ApplicationProcess>
125    <parameterList>
126      <parameter uniqueID="UID_1" access="readWrite" multiplier="3" offset="25">
127        <label lang="en">NonMapableExample_U8</label>
128        <USINT/>
129        <actualValue value="150"/>
130        <defaultValue value ="100"/>
131        <allowedValues>
132          <range>
133            <minValue value="0x19"/>
134            <maxValue value="0xFF"/>
135          </range>
136          <value="0x19"/>
137          <value="0x34"/>
138          <value="0x88"/>
139          <value="0xEF"/>
140          <value="0xF0"/>
141          <value="0xFF"/>
142        </allowedValues>
143      </parameter>
163    </parameterList>
164  </ApplicationProcess>
```

Fig. 15. ApplicationProcess - uniqueUD

defaultvalue

Determines the default value of the parameter.

actualValue

The actual value of the parameter. XDD files does not contain this attribute. User inputs and actual configured values are considered in this attribute. If the attribute *actualValue* is used the file has to be stored as an .xdc

Scaling

The parameter elements offset and multiplier are used for scaling purposes. Scaling is used to describe a differences of the displayed value to the one given by the device.

This formula is used: “Displayed value = (value + offset) * multiplier”

A Sample is given below.

```
086  <ApplicationProcess>
125    <parameterList>
126      <parameter uniqueID="UID_1" access="readWrite" multiplier="3" offset="25">
127        <label lang="en">NonMapableExample_U8</label>
128        <USINT/>
129        <actualValue value="150"/>
130        <defaultValue value ="100"/>
143      </parameter>
163    </parameterList>
```

Fig. 16. 163 </ApplicationProcess>Application Process - Scaling

allowedValues

Parameters can be limited by defining ranges. Ranges are sub-elements of allowed values. With the attributes minValue and maxValue a value can be assigned to a range which tools can check and use. The allowedValues element does have a reference to a parameter template which is describe in chapter 6.2.

A sample is given below.

```
086  <ApplicationProcess>
125    <parameterList>
126      <parameter uniqueID="UID_1" access="readWrite" multiplier="3" offset="25">
127        <label lang="en">NonMapableExample_U8</label>
128        <USINT/>
129        <actualValue value="150"/>
130        <defaultValue value ="100"/>
131        <allowedValues>
132          <range>
133            <minValue value="0x19"/>
134            <maxValue value="0xFF"/>
135          </range>
136          <value="0x19"/>
137          <value="0x34"/>
138          <value="0x88"/>
139          <value="0xEF"/>
140          <value="0xF0"/>
141          <value="0xFF"/>
142        </allowedValues>
143      </parameter>
163    </parameterList>
164  </ApplicationProcess>
```

Fig. 17. Aplication Process - Ranges

6.2 templateList

Templates are used in case settings of parameters can be reused. This is on one hand to minimize the work to create a XDD/XDC and on the other hand to minimize the size of the XML. Templates are referenced with the attribute “templateIDRef” from the element “parameter” or “allowedValues”. The

values from “parameterTemplate” or “allowedValuesTemplate” need to be used within tools if the corresponding element or attribute of “parameter” or “allowedValues” is not present, else the values are taken from attribute or element of “parameter” or “allowedValues”. From “parameterTemplate” or “allowedValuesTemplate” there can be no further references to other templates. In case the parameter does have a defaultvalue or actual value direct described as well as within a template the direct described value need to be taken.

A sample is given below.

```
086  <ApplicationProcess>
108    <templateList>
109      <parameterTemplate uniqueID="PTUID_2" access="readWrite">
110        <USINT/>
111        <defaultValue value="0x22"/>
112        <allowedValues>
113          <range>
114            <minValue value="0x10"/>
115            <maxValue value="0x40"/>
116          </range>
117        </allowedValues>
118      </parameterTemplate>
119      <allowedValuesTemplate uniqueID="AVTUID_3">
120        <range>
121         <minValue value="0x80"/>
122         <maxValue value="0xDD"/>
123        </range>
124      </allowedValuesTemplate>
125    </templateList>
126    <parameterList>
144      <parameter uniqueID="UID_2" templateIDRef="PTUID_2">
145        <label lang="en">NonMapableExample_U8</label>
146        <USINT/>
147        <defaultValue value="0x35"/>
148      </parameter>
149      <parameter uniqueID="UID_3" access="readWrite">
150        <label lang="en">Second_U16</label>
151        <UINT/>
152        <defaultValue value="0xAB"/>
153        <allowedValues templateIDRef="AVTUID_3"/>
154      </parameter>
163    </parameterList>
164  </ApplicationProcess>
```

Fig. 18. ApplicationProcess – paramterTemplate, allowedValuesTemplate

6.3 dataTypeList

The optional dataTypeList element is present if complex data types like arrays or data structures are needed inside variable declarations or parameter specifications of the device profile.

If present, the dataTypeList element contains a sequence of one to many elements out of the choice of:

an array element,

a struct element,

an enum element or

a derived element.

6.3.1 struct

The struct element serves to describe a structured data type, which may be referenced from an interface variable of a function type, from an array type definition, from a component variable inside the definition of another structured data type, or from a parameter specification.

varDeclaration

In the context of the definition of a structured data type, the varDeclaration element describes a single component variable (member) of the structure.

The varDeclaration element may contain the element group g_labels with one or more subelements. The group g_labels supports the introduction of a label (name) and a description in the context of the parent element The data type of the component variable or interface variable is either defined by an element describing a simple data type out of the group g_simple, or by an element dataTypeIDRef, which references one of the defined complex data types within the dataTypeList element. All further properties of the variable are contained in the attributes of the varDeclaration element, as given in the following table.

Attribute	Data type	Use	Description
name	xsd:string	required	Name of the interface variable or structure component
uniqueID	xsd:ID	required	Unique ID of the interface variable or structure component
size	xsd:string	optional	Number of elements, if the interface variable or structure component is of type anonymous ARRAY, BITSTRING, STRING or WSTRING
initialValue	xsd:string	optional	Initial value of the interface variable or structure component

6.3.1.1.1 Signals

Signals are bits or bitgroups which are derived from a tatatype out of the g_Simple group.

Bits can either be described as a single bit or a group of bits. In case the bits does not describe the referenced datatype completely in term of length, filling bits shall be used. These filling bits can either be located between used data bits or at the end to fill up the data type.

Signals can be used to describe the digital channels of an I/O system. Usually, the digital I/O data are transmitted by the device in multiple of bytes, of which the channels are represented by the single bits. Tools are splitting up those datatypes as described and show them bit-by-bit as single datapoints

A sample is given below.

```
086         <ApplicationProcess>
087           <dataTypeList>
088             <struct name="TypeStruct01" uniqueID="UID_DT_4">
089              <varDeclaration name="Bitstring_1" uniqueID="UID_DT_4_Bitstring_1" size="184">
090                 <label lang="en">Englishdescription of Bitstring</label>
091                 <BITSTRING/>
092               </varDeclaration>
093               <varDeclaration name="Byte_1" uniqueID="UID_DT_4_Byte_1" size="1">
094                 <label lang="en">English description of Bitstring</label>
095                 <USINT/>
096               </varDeclaration>
097               <varDeclaration name="Bitstring_2" uniqueID="UID_DT_4_Bitstring_2" size="3">
098                 <labellang="en">  English description of U8</label>
099                 <BITSTRING/>
100               </varDeclaration>
101               <varDeclaration name="Fillbts_1" uniqueID="UID_DT_4_Fillbits_1" size="5">
102                 <label lang="en">English description of Fillbits</label>
103                 <BITRSTRING/>
104               </varDeclaration>
105             </struct>
106           </dataTypeList>
125           <parameterList>
155           <parameter uniqueID="UID_4" access="readWrite">
156             <label lang="en">"Domain_with_defined_length</label>
157             <dataTypeIDRef uniqueIDRef="UID_DT_4"/>
158           </parameter>
163         </parameterList>
164       </ApplicationProcess>
```

Tab. 16 Application process - Signals

6.3.2 Domains

The ObjectList does not offer an attribute to describe the length of a domain. In case of PDO mapping the length is an important issue. This length can be achieved by defining a parameter in the application process. The functionalities described above can be used to describe a domain. The length of the domain is the sum of the length of the described parameters of the parameterList. This is important in case of mapable objexts.

A sample is given below

ObjectList

```
395      <Object index="2004" name="MOD_InImg" objectType="7" PDOmapping="no"
396              uniqueIDRef="UID_5" />
```

ApplicationProcess

```
086        <ApplicationProcess>
124          <parameterList>
159          <parameter uniqueID="UID_5" access="readWrite">
160            <label lang="en">"Domain_with_defined_length</label>
161            <USINT/>
162          </parameter>
163        </parameterList>
164      </ApplicationProcess>
```

Fig. 19. Application Process - Domains

App. 1 XDC Sample

```
<?xml version="1.0" encoding="UTF-8" ?>
<ISO15745ProfileContainer
  xmlns="http://www.ethernet-powerlink.org"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.ethernet-powerlink.org Powerlink_Main.xsd">
  <!-- Device Profile POWERLINK-->
  <ISO15745Profile>
    <ProfileHeader>
      <ProfileIdentification>EPL_Device_Profile_name</ProfileIdentification>
      <ProfileRevision>1</ProfileRevision>
      <ProfileName>Ethernet POWERLINK MyName device profile</ProfileName>
      <ProfileSource/>
      <ProfileClassID>Device</ProfileClassID>
      <ISO15745Reference>
        <ISO15745Part>4</ISO15745Part>
        <ISO15745Edition>1</ISO15745Edition>
        <ProfileTechnology>Powerlink</ProfileTechnology>
    </ISO15745Reference>
    </ProfileHeader>
    <ProfileBody
      xsi:type="ProfileBody_Device_Powerlink"
      fileName="filename"
      fileCreator="creator_name"
      fileCreationDate="2006-07-10"
      fileCreationTime="15:00:00+01:00"
      fileModificationDate="2007-06-18"
      fileModificationTime="15:20:00+01:00"
      fileModifiedBy="modifier_name"
      fileVersion="00.01"
      supportedLanguages="en">
      <DeviceIdentity>
        <vendorName>vendor_name</vendorName>
        <vendorID>0x12345678</vendorID>
        <vendorText>
          <label lang="en">Experiencing problems - contact our support : +1</label>
        </vendorText>
        <deviceFamily>
          <label lang="en">Modular I/O system</label>
        </deviceFamily>
        <productName>MyName</productName>
        <productID>1234</productID>
        <productText>
          <label lang="en">POWERLINK Dummy I/O device</label>
        </productText>
        <orderNumber>order_text</orderNumber>
        <version versionType="HW">1</version>
        <version versionType="FW">1</version>
        <version versionType="SW">1</version>
      </DeviceIdentity>
      <DeviceFunction>
        <capabilities>
          <characteristicsList>
            <characteristic>
              <characteristicName>
                <label lang="en">Operational voltages</label>
              </characteristicName>
              <characteristicContent>
                <label lang="en">12 V</label>
              </characteristicContent>
              <characteristicContent>
                <label lang="en">24 V</label>
              </characteristicContent>
              </characteristic>
```

```
064               <characteristic>
065               <characteristicName>
066                 <label lang="en">Transfer rate</label>
067               </characteristicName>
068               <characteristicContent>
069                 <label lang="en">100 MBit/s</label>
070               </characteristicContent>
071             </characteristic>
072             <characteristic>
073               <characteristicName>
074                 <label lang="en">Mounting orientation</label>
075               </characteristicName>
076               <characteristicContent>
077                 <label lang="en">Horizontal</label>
078               </characteristicContent>
079               <characteristicContent>
080                 <label lang="en">Vertical</label>
081               </characteristicContent>
082             </characteristic>
083           </characteristicsList>
084         </capabilities>
085       </DeviceFunction>
086       <ApplicationProcess>
087         <dataTypeList>
088           <struct name="TypeStruct01" uniqueID="UID_DT_4">
089            <varDeclaration name="Bitstring_1" uniqueID="UID_DT_4_Bitstring_1" size="184">
090              <label lang="en">Englishdescription of Bitstring</label>
091              <BITSTRING/>
092            </varDeclaration>
093            <varDeclaration name="Byte_1" uniqueID="UID_DT_4_Byte_1" size="1">
094              <label lang="en">English description of Bitstring</label>
095              <USINT/>
096            </varDeclaration>
097            <varDeclaration name="Bitstring_2" uniqueID="UID_DT_4_Bitstring_2" size="3">
098              <labellang="en">  English description of U8</label>
099              <BITSTRING/>
100            </varDeclaration>
101            <varDeclaration name="Fillbts_1" uniqueID="UID_DT_4_Fillbits_1" size="5">
102              <label lang="en">English description of Fillbits</label>
103              <BITRSTRING/>
104            </varDeclaration>
105           </struct>
106         </dataTypeList>
107         <templateList>
108           <parameterTemplate uniqueID="PTUID_2" access="readWrite">
109             <USINT/>
110             <defaultValue value="0x22"/>
111             <allowedValues>
112               <range>
113                 <minValue value="0x10"/>
114                 <maxValue value="0x40"/>
115               </range>
116             </allowedValues>
117           </parameterTemplate>
118           <allowedValuesTemplate uniqueID="AVTUID_3">
119             <range>
120               <minValue value="0x80"/>
121               <maxValue value="0xDD"/>
122             </range>
123           </allowedValuesTemplate>
124         </templateList>
125         <parameterList>
126           <parameter uniqueID="UID_1" access="readWrite" multiplier="3" offset="25">
127             <label lang="en">NonMapableExample_U8</label>
128             <USINT/>
129             <actualValue value="150"/>
130             <defaultValue value ="100"/>
```

```
131             <allowedValues>
132               <range>
133                 <minValue value="0x19"/>
134                 <maxValue value="0xFF"/>
135               </range>
136               <value="0x19"/>
137               <value="0x34"/>
138               <value="0x88"/>
139               <value="0xEF"/>
140               <value="0xF0"/>
141               <value="0xFF"/>
142             </allowedValues>
143           </parameter>
144         <parameter uniqueID="UID_2" templateIDRef="PTUID_2">
145           <label lang="en">NonMapableExample_U8</label>
146           <USINT/>
147           <defaultValue value="0x35"/>
148         </parameter>
149         <parameter uniqueID="UID_3" access="readWrite">
150           <label lang="en">Second_U16</label>
151           <UINT/>
152           <defaultValue value="0xAB"/>
153           <allowedValues templateIDRef="AVTUID_3"/>
154         </parameter>
155         <parameter uniqueID="UID_4" access="readWrite">
156           <label lang="en">"Domain_with_defined_length</label>
157           <dataTypeIDRef uniqueIDRef="UID_DT_4"/>
158         </parameter>
159         <parameter uniqueID="UID_5" access="readWrite">
160           <label lang="en">"Domain_with_defined_length</label>
161           <USINT/>
162         </parameter>
163       </parameterList>
164     </ApplicationProcess>
165   </ProfileBody>
166   </ISO15745Profile>
167   <!-- Communication Profile POWERLINK-->
168   <ISO15745Profile>
169     <ProfileHeader>
170       <ProfileIdentification>EPL_Device_Profile_name</ProfileIdentification>
171       <ProfileRevision>1</ProfileRevision>
172       <ProfileName>ETHERNET Powerlink name device profile</ProfileName>
173       <ProfileSource/>
174       <ProfileClassID>CommunicationNetwork</ProfileClassID>
175       <ISO15745Reference>
176         <ISO15745Part>4</ISO15745Part>
177         <ISO15745Edition>1</ISO15745Edition>
178         <ProfileTechnology>Powerlink</ProfileTechnology>
179       </ISO15745Reference>
180     </ProfileHeader>
181      <ProfileBody
182       xsi:type="ProfileBody_CommunicationNetwork_Powerlink"
183       fileName="filename"
184       fileCreator="creator_name"
185       fileCreationDate="2006-07-10"
186       fileCreationTime="15:00:00+01:00"
187       fileModificationDate="2007-06-18"
188       fileModificationTime="15:20:00+01:00"
189       fileModifiedBy="modifier_name"
190       fileVersion="00.01"
191       supportedLanguages="en">
192       <ApplicationLayers>
193         <identity>
194           <vendorID>0x12345678</vendorID>
195           <productID>1234</productID>
196           <version versionType="HW">1</version>
197           <version versionType="FW">1</version>
```

```
198           <version versionType="SW">1</version>
199         </identity>
200         <DataTypeList>
201           <defType dataType="0001"><Boolean/></defType>
202           <defType dataType="0002"><Integer8/></defType>
203           <defType dataType="0003"><Integer16/></defType>
204           <defType dataType="0004"><Integer32/></defType>
205           <defType dataType="0005"><Unsigned8/></defType>
206           <defType dataType="0006"><Unsigned16/></defType>
207           <defType dataType="0007"><Unsigned32/></defType>
208           <defType dataType="0008"><Real32/></defType>
209           <defType dataType="0009"><Visible_String/></defType>
210           <defType dataType="0010"><Integer24/></defType>
211           <defType dataType="0011"><Real64/></defType>
212           <defType dataType="0012"><Integer40/></defType>
213           <defType dataType="0013"><Integer48/></defType>
214           <defType dataType="0014"><Integer56/></defType>
215           <defType dataType="0015"><Integer64/></defType>
216           <defType dataType="000A"><Octet_String/></defType>
217           <defType dataType="000B"><Unicode_String/></defType>
218           <defType dataType="000C"><Time_of_Day/></defType>
219           <defType dataType="000D"><Time_Diff/></defType>
220           <defType dataType="000F"><Domain/></defType>
221           <defType dataType="0016"><Unsigned24/></defType>
222           <defType dataType="0018"><Unsigned40/></defType>
223           <defType dataType="0019"><Unsigned48/></defType>
224           <defType dataType="001A"><Unsigned56/></defType>
225           <defType dataType="001B"><Unsigned64/></defType>
226           <defType dataType="0401"><MAC_ADDRESS/></defType>
227           <defType dataType="0402"><IP_ADDRESS/></defType>
228           <defType dataType="0403"><NETTIME/></defType>
229         </DataTypeList>
230         <ObjectList>
231           <!-- mandatory Objects -->
232           <Object index="1000" name="NMT_DeviceType_U32" objectType="7"/>
233           <Object index="1001" name="ERR_ErrorRegister_U8" objectType="7"/>
234           <Object index="1006" name="NMT_CycleLen_U32" objectType="7"/>
235           <Object index="1018" name="NMT_IdentityObject_REC" objectType="9">
236             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="4"/>
237             <SubObject subIndex="01" name="VendorId_U32" objectType="7"
               defaultValue=”0x00000000”/>
238             <SubObject subIndex="02" name="ProductCode_U32" objectType="7"/>
239             <SubObject subIndex="03" name="RevisionNo_U32" objectType="7"/>
240             <SubObject subIndex="04" name="SerialNo_U32" objectType="7"/>
241           </Object>
242           <Object index="1020" name="CFM_VerifyConfiguration_REC" objectType="9">
243             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="2"/>
244             <SubObject subIndex="01" name="ConfDate_U32" objectType="7"/>
245             <SubObject subIndex="02" name="ConfTime_U32" objectType="7"/>
246           </Object>
247           <Object index="1030" name="NMT_InterfaceGroup_0h_REC" objectType="9">
248             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="9"/>
249             <SubObject subIndex="01" name="InterfaceIndex_U16" objectType="7"/>
250             <SubObject subIndex="02" name="InterfaceDescription_VSTR" objectType="7"/>
251             <SubObject subIndex="03" name="InterfaceType_U8" objectType="7"/>
252             <SubObject subIndex="04" name="InterfaceMtu_U16" objectType="7"/>
253             <SubObject subIndex="05" name="InterfacePhysAddress_OSTR" objectType="7"/>
254             <SubObject subIndex="06" name="InterfaceName_VSTR" objectType="7"/>
255             <SubObject subIndex="07" name="InterfaceOperStatus_U8" objectType="7"/>
256             <SubObject subIndex="08" name="InterfaceAdminState_U8" objectType="7"/>
257             <SubObject subIndex="09" name="Valid_BOOL" objectType="7" objectType="7"/>
258           </Object>
259           <Object index="1300" name="SDO_SequLayerTimeout_U32" objectType="7"/>
260           <Object index="1C0B" name="DLL_CNLossSoC_REC" objectType="9">
261             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="3"/>
262             <SubObject subIndex="01" name="CumulativeCnt_U32" objectType="7"/>
263             <SubObject subIndex="02" name="ThresholdCnt_U32" objectType="7"/>
```

```
264             <SubObject subIndex="03" name="Threshold_U32" objectType="7"/>
265           </Object>
266           <Object index="1C0F" name="DLL_CNCRCError_REC" objectType="9">
267             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="3"/>
268             <SubObject subIndex="01" name="CumulativeCnt_U32" objectType="7"/>
269             <SubObject subIndex="02" name="ThresholdCnt_U32" objectType="7"/>
270             <SubObject subIndex="03" name="Threshold_U32" objectType="7"/>
271           </Object>
272           <Object index="1C14" name="DLL_CNLossOfSocTolerance_U32" objectType="7"/>
273           <Object index="1F82" name="NMT_FeatureFlags_U32" objectType="7" value"0607"/>
274           <Object index="1F83" name="NMT_EPLVersion_U8" objectType="7"/>
275           <Object index="1F8C" name="NMT_CurrNMTState_U8" objectType="7"/>
276           <Object index="1F93" name="NMT_EPLNodeID_REC" objectType="9">
277             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="2"/>
278             <SubObject subIndex="01" name="NodeID_U8" objectType="7"/>
279             <SubObject subIndex="02" name="NodeIDByHW_BOOL" objectType="7"/>
280           </Object>
281           <Object index="1F98" name="NMT_CycleTiming_REC" objectType="9">
282             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" defaultValue="8"/>
283             <SubObject subIndex="01" name="IsochrTxMaxPayload_U16" objectType="7"/>
284             <SubObject subIndex="02" name="IsochrRxMaxPayload_U16" objectType="7"/>
285             <SubObject subIndex="03" name="PResMaxLatency_U32" objectType="7"/>
286             <SubObject subIndex="04" name="PReqActPayload_U16" objectType="7"/>
287             <SubObject subIndex="05" name="PResActPayload_U16" objectType="7"/>
288             <SubObject subIndex="06" name="ASndMaxLatency_U32" objectType="7"/>
289             <SubObject subIndex="07" name="MultiplCycleCnt_U8" objectType="7"/>
290             <SubObject subIndex="08" name="AsyncMTUSize_U16" objectType="7"/>
291           </Object>
292           <Object index="1F99" name="NMT_CNBasicEthernetTimeout_U32" objectType="7"/>
293           <Object index="1F9E" name="NMT_ResetCmd_U8" objectType="7"/>
294           <!-- end of mandatory Objects -->
295           <!-- Sample for object flags -->
296           <!-- "write on download not allowed" and "change of value takes effect after
297                reset"-->
298           <Object index="4900" name="ObjFlagsDescription" objectType="7" PDOmapping="no"
299                                accessType="rw" dataType="0006" objFlags="0001" />
300           <!-- End Sample for object flags -->
301           <!-- Sample store configuration -->
302           <Object index="1010" name="NMT_StoreParam_REC" objectType="9">
303             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" dataType="0005"
304                        accessType="const" defaultValue="0x1" PDOmapping="no" />
305             <SubObject subIndex="01" name="AllParam_U32" objectType="7" dataType="0007"
306                        accessType="rw" defaultValue="0" PDOmapping="no" />
307           </Object>
308           <!-- End Sample store configuration -->
309           <!-- Sample static mapping -->
310           <!-- Mapping object within the communication area -->
311           <Object index="1800" name="PDO_TxCommParam_0h_REC" objectType="9">
312             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" dataType="0005"
313                        accessType="ro" defaultValue="0x2" PDOmapping="no" />
314             <SubObject subIndex="01" name="NodeID_U8" objectType="7" dataType="0005"
315                        accessType="rw" defaultValue="0x0" PDOmapping="no" />
316             <SubObject subIndex="02" name="MappingVersion_U8" objectType="7" dataType="0005"
317                        accessType="ro" defaultValue="0x0" PDOmapping="no" />
318           </Object>
319           <Object index="1A00" name="PDO_TxMappParam_0h_AU64" objectType="8">
320             <SubObject subIndex="00" name="NumberOfEntries" objectType="7" dataType="0005"
321                        accessType="ro" defaultValue="0x0A" PDOmapping="no" />
322             <SubObject subIndex="01" name="ObjectMapping 1" objectType="7" dataType="001B"
323                        accessType="ro" defaultValue="0x0010000000003000" PDOmapping="no" />
324             <SubObject subIndex="02" name="ObjectMapping 2" objectType="7" dataType="001B"
325                        accessType="ro" defaultValue="0x0020001000016020" PDOmapping="no" />
326             <SubObject subIndex="03" name="ObjectMapping 3" objectType="7" dataType="001B"
327                        accessType="ro" defaultValue="0x0010003000016030" PDOmapping="no" />
328             <SubObject subIndex="04" name="ObjectMapping 4" objectType="7" dataType="001B"
329                        accessType="ro" defaultValue="0x0010004000016040" PDOmapping="no" />
330             <SubObject subIndex="05" name="ObjectMapping 5" objectType="7" dataType="001B"
```

```
                    accessType="ro" defaultValue="0x0020005000026020" PDOmapping="no" />
      <SubObject subIndex="06" name="ObjectMapping 6" objectType="7" dataType="001B"
                    accessType="ro" defaultValue="0x0010007000026030" PDOmapping="no" />
      <SubObject subIndex="07" name="ObjectMapping 7" objectType="7" dataType="001B"
                    accessType="ro" defaultValue="0x0010008000026040" PDOmapping="no" />
      <SubObject subIndex="08" name="ObjectMapping 8" objectType="7" dataType="001B"
                    accessType="ro" defaultValue="0x0020009000036020" PDOmapping="no" />
      <SubObject subIndex="09" name="ObjectMapping 9" objectType="7" dataType="001B"
                    accessType="ro" defaultValue="0x001000B000036030" PDOmapping="no" />
      <SubObject subIndex="0A" name="ObjectMapping 10" objectType="7" dataType="001B"
                    accessType="ro" defaultValue="0x001000C000036040" PDOmapping="no" />
    </Object>
    <!-- corresponding objects within the Object dictionary -->
    <Object index="3000" name="Status" objectType="7" PDOmapping="default"
            accessType="ro" dataType="0006" defaultValue="0x00" />
    <Object index="6020" name="Position_Values" objectType="8" dataType="0004">
      <SubObject subIndex="00" name="Number_of_Entries" objectType="7" dataType="0005"
                    accessType="const" defaultValue="0x3" PDOmapping="no" />
      <SubObject subIndex="01" name="Position_Value1" objectType="7" dataType="0004"
                     accessType="ro" defaultValue="0x0" PDOmapping="default" />
      <SubObject subIndex="02" name="Position_Value2" objectType="7" dataType="0004"
                    accessType="ro" defaultValue="0x0" PDOmapping="default" />
      <SubObject subIndex="03" name="Position_Value3" objectType="7" dataType="0004"
                    accessType="ro" defaultValue="0x0" PDOmapping="default" />
    </Object>
    <Object index="6030" name="Speed_Values" objectType="8" dataType="0003">
      <SubObject subIndex="00" name="Number_of_Entries" objectType="7" dataType="0005"
                    accessType="const" defaultValue="0x3" PDOmapping="no" />
      <SubObject subIndex="01" name="Speed_Value1" objectType="7" dataType="0003"
                    accessType="ro" defaultValue="0x0" PDOmapping="default" />
      <SubObject subIndex="02" name="Speed_Value2" objectType="7" dataType="0003"
                    accessType="ro" defaultValue="0x0" PDOmapping="default" />
      <SubObject subIndex="03" name="Speed_Value3" objectType="7" dataType="0003"
                    accessType="ro" defaultValue="0x0" PDOmapping="default" />
    </Object>
    <Object index="6040" name="Acceleration Values" objectType="8" dataType="0003">
      <SubObject subIndex="00" name="Number_of_Entries" objectType="7" dataType="0005"
                    accessType="const" defaultValue="0x3" PDOmapping="no" />
      <SubObject subIndex="01" name="Acceleration_Value1" objectType="7"
                    dataType="0003" accessType="ro" defaultValue="0x0000"
                    PDOmapping="default" />
      <SubObject subIndex="02" name="Acceleration_Value2" objectType="7"
                    dataType="0003" accessType="ro" defaultValue="0x0"
                    PDOmapping="default" />
      <SubObject subIndex="03" name="Acceleration_Value3" objectType="7"
                    dataType="0003" accessType="ro" defaultValue="0x0"
                    PDOmapping="default" />
    </Object>
    <!-- End Sample static mapping -->
    <!-- Samples of uniqueIDRef to application Process -->
    <Object index="2000" name="NonMapableExample_U8" objectType="7" PDOmapping="no"
            uniqueIDRef="UID_1"/>
    <Object index="2001" name="NonMapableExample2_U8" objectType="7" PDOmapping="no"
            uniqueIDRef="UID_2"/>
    <Object index="2002" name="Example_REC" objectType="9">
      <SubObject subIndex="00" name="NumberOfEntries" objectType="7" dataType="0005"
                    accessType="const" defaultValue="2" PDOmapping="no"/>
      <SubObject subIndex="01" name="Second_U16" objectType="7" uniqueIDRef="UID_3"
                    PDOmapping="no"/>
      <SubObject subIndex="02" name="ApplicationParam_U8" objectType="7"
                    PDOmapping="no"/>
    </Object>
    <Object index="2003" name="BitObject_U8" objectType="7" PDOmapping="no"
            uniqueIDRef="UID_4"/>
    <Object index="2004" name="MOD_InImg" objectType="7" PDOmapping="no"
            uniqueIDRef="UID_5" />
    <!-- End Samples of uniqueIDRef to application Process -->
```

```
398           </ObjectList>
399         </ApplicationLayers>
400         <TransportLayers/>
401         <NetworkManagement>
402           <GeneralFeatures
403            DLLFeatureMN="false"
404            NMTBootTimeNotActive="4000"
405            NMTCycleTimeMax="60000"
406            NMTCycleTimeMin="200"
407            NMTErrorEntries="2"
408            NWLIPSupport="false"
409            SDOServer="true"
410            SDOMaxConnections="1"
411            SDOMaxParallelConnections="1"/>
412           <CNFeatures
413            DLLCNFeatureMultiplex="true"
414            NMTCNSoC2PReq="0"/>
415         </NetworkManagement>
416       </ProfileBody>
417     </ISO15745Profile>
418   </ISO15745ProfileContainer>
```