

FDCML 2.0 Specification

Version 1.0

1.	Introduction	6
2.	Requirements	7
3.	Device Model.....	8
3.1	Device Profile	8
3.1.1	Device Group	9
3.1.2	Document Structure	10
4.	Modeling Patterns.....	11
4.1	Naming and Commenting	11
4.2	Element Values	11
4.3	Modeling Conditional Device Behavior	11
4.4	Specification by Type Attribute	11
4.5	Internal Referencing with XPath	12
5.	FDCML Reference	13
5.1	Directory Structure	13
5.2	Document Root <ISO15745Profile>	13
5.3	Access Path Element <accessPath>.....	13
5.4	Additional Information Element <AdditionalInformation>	14
5.5	Additional Item Element <additionalItem>.....	14
5.6	Additional Item Category Element <additionalItemCategory>	15
5.7	Additional Item List Element <additionalItemList>.....	16
5.8	Alignment Element <alignment>.....	17
5.9	Application Process Element <ApplicationProcess>.....	17
5.10	Argument Element <argument>.....	17
5.11	Argument List Element <argumentList>	19
5.12	Array Type Element <arrayType>	19
5.13	Build Date Element <buildDate>	20
5.14	Capabilities Element <capabilities>	20
5.15	Change Element <change>	20
5.16	Channel Element <channel>.....	21
5.17	Channel List Element <channelList>	22
5.18	Characteristic Element <characteristic>	22
5.19	Characteristics List Element <characteristicsList>.....	23
5.20	Communication Entity Element <communicationEntity>.....	23
5.21	Configuration Item List Element <cfgItemList>.....	25
5.22	Connection Element <connection>.....	26
5.23	Connection List Element <connectionList>	26
5.24	Constant Element <const>.....	27
5.25	Datatype Element <datatype>	27
5.26	Data Type Instance Element <datatypeInstance>	28
5.27	Data Type Template Element <datatypeTemplate>	28
5.28	Datatype Template List Element <datatypeTemplateList>	29
5.29	Dedicated Configuration Item Element <dedicatedCfgItem>.....	29
5.30	Default Element <default>	31
5.31	Default File Element <defaultFile>	31
5.32	Delete Entity Element <deleteEntity>	31
5.33	Device Family Element <deviceFamily>.....	32
5.34	Device Function Element <DeviceFunction>.....	32
5.35	Device Identity Element <DeviceIdentity>	33
5.36	Device Manager Element <DeviceManager>.....	33
5.37	Device Structure Element <deviceStructure>	34

5.38	Dictionary Element <dictionary>	35
5.39	Dictionary List Element <dictionaryList>.....	35
5.40	Directly Derived Type Element <directlyDerivedType>	35
5.41	Disable Element <disable>	36
5.42	Edit Element <edit>.....	36
5.43	Enable Element <enable>	37
5.44	Endianess Element <endianess>.....	37
5.45	Enumerated Type Element <enumeratedType>	38
5.46	Enumerated Value Element <enumeratedValue>	38
5.47	Enumeration Element <enumeration>	39
5.48	External Schema Element <externalSchema>.....	39
5.49	File Element <file>	40
5.50	Gain Element <gain>	40
5.51	Help Element <help>	41
5.52	Help File Element <helpFile>	43
5.53	Help File List Element <helpFileList>	43
5.54	Help File Reference Element <helpFileRef>	44
5.55	Help Reference Element <helpRef>	45
5.56	Hotspot Element <hotspot>	47
5.57	Hotspot List Element <hotspotList>.....	47
5.58	IAS Interface Type Element <IASInterfaceType>	48
5.59	Identity Element <identity>	48
5.60	Import List Element <importList>.....	49
5.61	Indicator List Element <indicatorList>.....	49
5.62	Instance Name Element <instanceName>	49
5.63	Instances Element <instances>.....	50
5.64	Instance Value Element <instanceValue>	51
5.65	Internal Connection Point Element <internalConnectionPoint>	52
5.66	Internal Connection Point List Element <internalConnectionPointList>.....	53
5.67	ISO 15745 Edition Element <ISO15745Edition>	53
5.68	ISO 15745 Part Element <ISO15745Part>.....	53
5.69	ISO 15745 Reference Element <ISO15745Reference>	54
5.70	Item Category Element <itemCategory>	54
5.71	Label Element <label>	55
5.72	Label Reference Element <labelRef>.....	57
5.73	LED Element <LED>.....	59
5.74	LED List Element <LEDList>	60
5.75	LED State Element <LEDState>.....	60
5.76	Local Data Category Element <localDataCategory>	61
5.77	Local Data Description Element <localDataDescription>.....	62
5.78	Local Data Description List Element <localDataDescriptionList>.....	62
5.79	Logical Connection Point Element <logicalConnectionPoint>	63
5.80	Logical Connection Point Assembly Element <logicalConnectionPointAssembly>	65
5.81	Logical Connection Point Assembly List Element <logicalConnectionPointAssemblyList>.....	65
5.82	Logical Connection Point List Element <logicalConnectionPointList>.....	66
5.83	MAU Element <MAU>	67
5.84	MAU List Element <MAUList>	68
5.85	MAU Usage Element <MAUUsage>.....	68
5.86	MAU Usage List Element <MAUUsageList>	69
5.87	Maximum Value Element <maxVal>.....	69
5.88	Method Category Element <methodCategory>	69
5.89	Method Description Element <methodDescription>	70
5.90	Method Description List Element <methodDescriptionList>	73
5.91	Minimum Value Element <minVal>.....	74
5.92	Modify Entity Element <modifyEntity>	74

5.93	Modify Value Element <modifyValue>	74
5.94	No Element <no>	75
5.95	Non Standardized Extension Element <nonStandardizedExtension>	76
5.96	Norm Compliance Element <normCompliance>	76
5.97	Offset Element <offset>	77
5.98	On Element <on>	77
5.99	Option Element <option>	78
5.100	Options List Element <optionsList>	78
5.101	Order Number Element <orderNumber>	79
5.102	Parameter Assembly Element <parameterAssembly>	79
5.103	Parameter Assembly Category Element <parameterAssemblyCategory>	80
5.104	Parameter Assembly List Element <parameterAssemblyList>	80
5.105	Parameter Category Element <parameterCategory>	81
5.106	Parameter Description Element <parameterDescription>	82
5.107	Parameter Description List Element <parameterDescriptionList>	83
5.108	Picture Element <picture>	83
5.109	Picture List Element <pictureList>	84
5.110	Process Data Assembly Element <processDataAssembly>	85
5.111	Process Data Assembly Category Element <processDataAssemblyCategory>	85
5.112	Process Data Assembly List Element <processDataAssemblyList>	86
5.113	Process Data Category Element <processDataCategory>	86
5.114	Process Data Description Element <processDataDescription>	87
5.115	Process Data Description List Element <processDataDescriptionList>	88
5.116	Processing Entity Element <processingEntity>	89
5.117	Product Family Element <productFamily>	90
5.118	Product ID Element <productID>	91
5.119	Product Name Element <productName>	91
5.120	Product Text Element <productText>	92
5.121	Profile Body Element <ProfileBody>	92
5.122	Profile Class ID Element <ProfileClassID>	93
5.123	Profile Date Element <ProfileDate>	93
5.124	Profile Header Element <ProfileHeader>	93
5.125	Profile Identification Element <ProfileIdentification>	94
5.126	Profile Name Element <ProfileName>	94
5.127	Profile Revision Element <ProfileRevision>	94
5.128	ProfilesBody Element <ProfilesBody>	95
5.129	Profile Source Element <ProfileSource>	95
5.130	Profile Technology Element <ProfileTechnology>	96
5.131	Provides Element <provides>	96
5.132	Range Element <range>	97
5.133	Recalc Entity Element <recalcEntity>	97
5.134	Recalc Value Element <recalcValue>	98
5.135	Reference Element <reference>	98
5.136	Relations Element <relations>	98
5.137	Serial Number <serialNumber>	99
5.138	Slot Element <slot>	99
5.139	Slot List Element <slotList>	100
5.140	Slot Usage Element <slotUsage>	100
5.141	Slot Usage List Element <slotUsageList>	101
5.142	Specification Revision Element <specificationRevision>	101
5.143	Specific Property Element <specificProperty>	101
5.144	Standard Compliance Element <standardCompliance>	103
5.145	Standard and Norm Compliance List Element <standardNormComplianceList>	104
5.146	Step Value Element <stepVal>	104
5.147	Structured Type Element <structuredType>	104
5.148	Subrange Element <subrange>	105

5.149	Subrange Type Element <subrangeType>.....	105
5.150	Subrange Variable Declaration <subrangeVarDeclaration>	106
5.151	Tool Element <tool>	106
5.152	Tool List Element <toolList>.....	107
5.153	Type Name Element <typeName>	107
5.154	Uncommitted Configuration Item Element <uncommittedCfgItem>.....	108
5.155	Uses Element <uses>.....	109
5.156	Value Element <value>	110
5.157	Variable Declaration Element <varDeclaration>	111
5.158	Vendor ID Element <vendorID>.....	111
5.159	Vendor Name Element <vendorName>	112
5.160	Vendor Text Element <vendorText>.....	112
5.161	Version Element <version>	112
5.162	Yes Element <yes>	113
6.	Additional Information	115
6.1	Datatype Elements	115
6.2	Language Identifier	117
6.3	Text Resource File Format	117
6.4	Format Specification	119

1. Introduction

This specification is an overview and reference description of the system independent device description language "Field Device Configuration Markup Language" (FDCML). FDCML is described in Extensible Markup Language (XML) using XML Schema for document definition. It is assumed that the reader is familiar with the concepts of XML and XML Schemas.

This specification does not contain a description of how to describe devices of a certain network or communication system with FDCML.

2. Requirements

Basic requirements fulfilled by FDCML are:

Network Independence

FDCML is able to describe Network Components in a network/bus independent manner without losing the ability to describe network specific properties.

Multi Language Support

FDCML is able to support descriptive text elements in multiple languages in one XML file.

Extensibility

FDCML is able to store more information as defined in this document without the need to change the format of the device description. This is obtained by the `<additionalItem>`, `<specificProperty>`, `<externalSchema>` and the `<nonStandardizedExtension>` elements.

3. Device Model

FDCML is able to describe devices, groups of devices or single aspects of devices.

3.1 Device Profile

A device profile is the representation of a physical device. It contains four basic elements as defined in ISO 15745-1:

*"The **device identity** object contains attributes which uniquely identify the device. Examples of such attributes are the manufacturer's identification, part number, revision, location of storage of additional information, and indication of the number and type of additional objects within the device.*

*The **device manager** object represents the set of attributes (e.g. revision of the device identity object) and services (e.g. reset, configure/run mode, retrieval of device manager object attributes) used to configure and to monitor a device integrated into the application system.*

*The **device function** object describes the intrinsic function of a device in terms of its technology (e.g. mechanical limit switch, proximity sensor, ultrasonic sensor). The device function object differentiates the technology of the device from the application of the device. Examples of device function objects are analog current input in milliamps, and discrete voltage output in volts.*

*The **application process** object represents a set of attributes and services that correspond to the application requirements captured in the attributes and services of the associated process profile. The application process object therefore describes the behaviour of the device in terms of the application, independent of the device technology."*

Figure 3-1 provides an overview how these elements are used for different tasks concerning device engineering and operation.

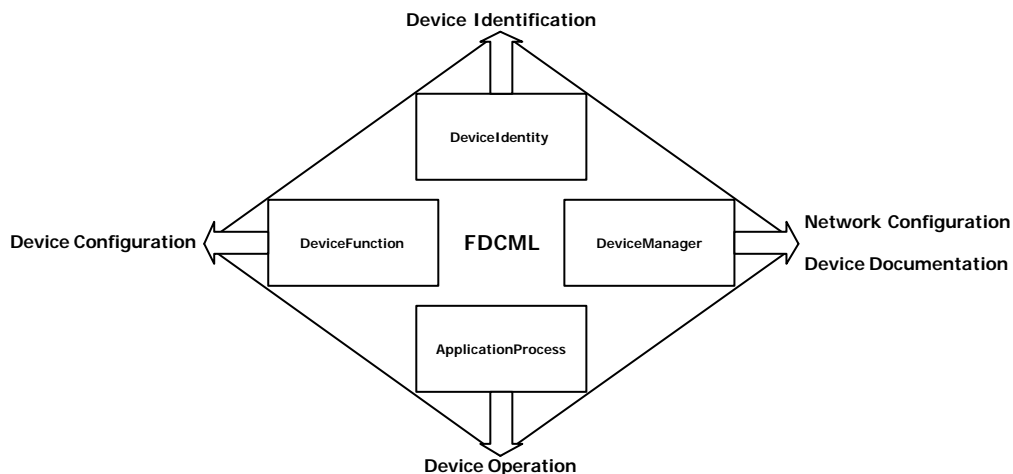


Figure 3-1: Tasks of the basic elements

Figure 3-2 is a simplified representation of the FDCML device model.

A Device Manager consists of one Device Structure and any number of Communication Entities and Processing Entities.

The Device Structure describes the physical structure of the device consisting of for instance network interfaces, physical terminals and logical channels.

A Communication Entity describes all network related properties like Communication Characteristics, the objects provided via certain Communication Capabilities through a physical network interface. Communication Objects may use channels (physical or logical) to gain access to the network.

Defining Communication Characteristics for a certain system is outside the scope of this specification.

A Processing Entity can be a container for Application Objects and may have Processing Characteristics like memory size.

The Application Process offers any number of functional views on a device. Variables defined herein shall be provided by Communication Objects of a Communication Entity.

The Device Function presents any number of engineering views on a device. These views can be used to configure the functionality of a device in an engineering environment. Variables defined herein shall be provided by Communication Objects of a Communication Entity.

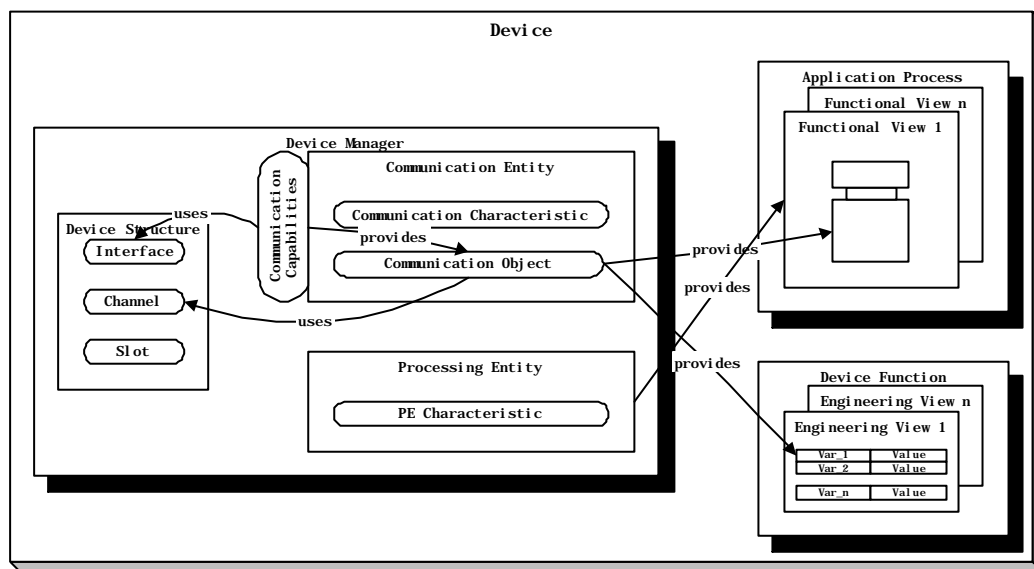


Figure 3-2: Simplified Device Model

Note: The definitions of the <ApplicationProcess> and <DeviceFunction> elements are outside the scope of this specification.

3.1.1 Device Group

FDCML is able to describe a set of devices along with their relations. These relations may be of logical (communication relation) and/or physical (cable connection) nature. The model is a set of device elements and an additional list of relations between objects of these devices, called connections.

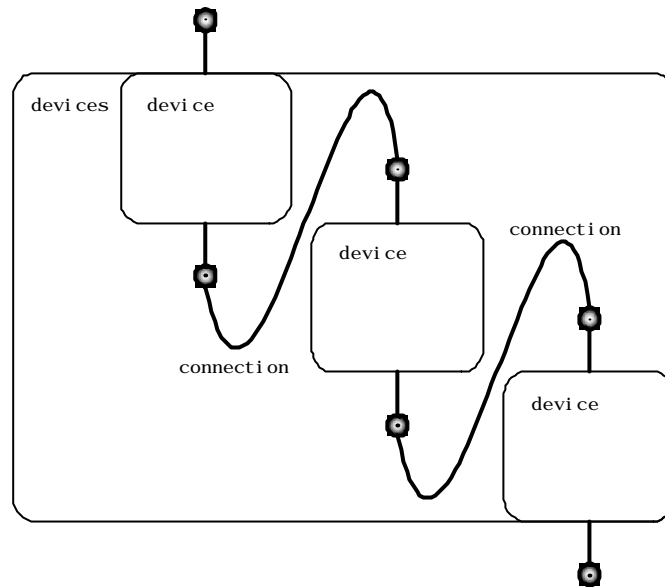


Figure 3-3: Group of Devices

3.1.2 Document Structure

ISO 15745 defines the root element `<ISO15745Profile>`, this element contains a header with file related information like creation date. Single devices are described with the `<ProfileBody>` element, groups of devices with `<ProfilesBody>` element.

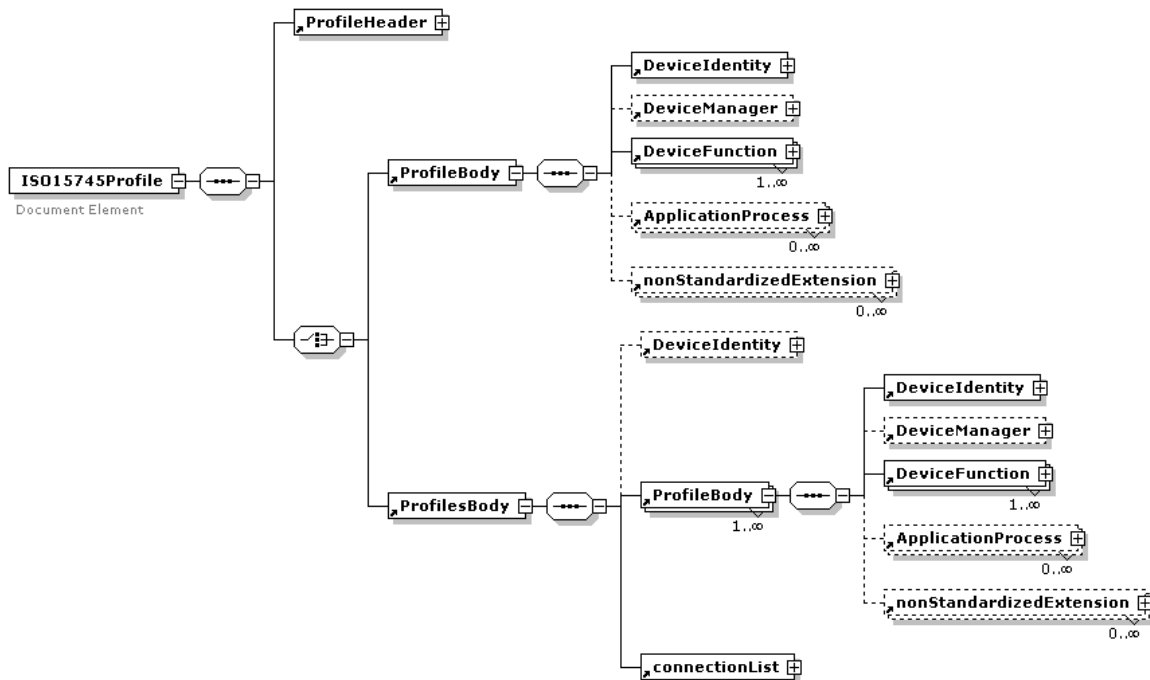


Figure 3-4: FDCML Document Structure

4. Modeling Patterns

4.1 Naming and Commenting

Every element, which needs a name for identification, has two possibilities to perform this task:

The text is stored in the XDDML instance (`<label>`, `<help>`)

The text is stored in an external file (`<labelRef>`, `<helpRef>`, `<helpFileRef>`)

- `<label>` Element, the display name of a FDCML element.
- `<help>` Element, additional descriptive text for a FDCML element.
- `<labelRef>` Element, definition of an external text resource.
- `<helpRef>` Element, definition of an external text resource.
- `<helpFileRef>` Element, definition of a external documentation (*.chm, *.hlp, *.pdf)

When using internal texts:

The `<label>` element is mandatory. The `<help>` element is optional. Both elements may appear n times, once for each language. For identifying the language, the `xml:lang` attribute is used by both elements. The usage of this language identifier is mandatory. Chapter 6.2 provides an overview of valid attribute values and used standards.

When using external texts:

The `<labelRef>` and `<helpRef>` elements provide a pointer to a text entry in a separate resource file. The format of this resource file is defined in Chapter 6.3. These resource files are defined in the `<dictionary>` element of the `<DeviceManager>`. External documentation is defined in the `<helpFile>` element.

The `<helpFileRef>` provides a pointer to an external documentation or a pointer to a bookmark in an external documentation, depending on the capabilities of the documentation format.

4.2 Element Values

For describing one or a set of valid element values, FDCML provides seven different elements:

- `<const>` element, it is used to describe a fixed element value.
- `<edit>` element, used to describe an editable element value (i.e. string value).
- `<enumeration>` element, describes a certain set of valid element values and names for these values.
- `<range>` element, describes one or more valid ranges of an element value.
- `<yes>`, `<no>` combination, describes a Boolean element value.
- `<reference>` element, it is used to provide a list of references to other elements in the device description.

4.3 Modeling Conditional Device Behavior

For modeling certain dynamic device behavior, FDCML uses relations. Three different relation mechanisms are provided:

- `<disable>` element, used to disable another element depending on certain object values.
- `<enable>` element, used to enable another element depending on certain object values.

- `<change>` element, used to change the value of another element depending on certain object values.

4.4 Specification by Type Attribute

In order to be independent from a certain set of network specific objects or properties, FDCML uses a generic element model. To give an element a specific meaning, the associated `type` (i.e. `additionalItemType`, `dedicatedCfgType`, etc.) attribute is used. The list of valid types can be expanded anytime without the need to change the FDCML schema. Lists of valid attribute values are provided by documents describing the modeling of devices for different networks and/or automation systems.

4.5 Internal Referencing with XPath

For internal referencing of FDCML elements XPath syntax is used.

5. FDCML Reference

Directory Structure

FDCML requires a two-level directory structure. The Schema resides in the root directory of a device description catalog. A catalog is a set of device descriptions. The first level directories describe the type name of the network or automation system. The second level directories order all device descriptions by vendor.

5.1 Document Root <ISO15745Profile>

The <ISO15745Profile> is the document element for describing a device or a group of devices.

Parent Elements

Element	Description
Document Instance	the device description file itself

Child Elements

Element	Multiplicity	Description
ProfileHeader	1	generic profile information
(
ProfileBody	1	description of a single device
	OR	
ProfilesBody	1	description of a group of devices
)		

Attributes

The <ISO15745Profile> element has no attributes.

5.2 Access Path Element <accessPath>

The <accessPath> defines a path to a communication object relative to a communication entity (<localDataDescription>, <parameterDescription>, <processDataDescription>, <methodDescription> element), the relative path to a part of an argument of a method (<argument>) or the path to a <channel>; i.e. its address.

Parent Elements

Element	Description
argument	description of an argument of a method
channel	description of a physical or logical channel
localDataDescription	data object produced or consumed locally on the device, thus not transmitted or received through a network
methodDescription	description of a method
parameterDescription	description of a parameter object
processDataDescription	description of a process data object

Child Elements

The content is a system specific address of the communication object. The type of content is xsd:string.

Attributes

The <accessPath> element has no attributes.

5.3 Additional Information Element <AdditionalInformation>

The <AdditionalInformation> element identifies the location of additional profile information.

Parent Elements

Element	Description
ProfileHeader	General profile information

Child Elements

Type of content is xsd:anyURI.

Attributes

The <AdditionalInformation> element has no attributes.

5.4 Additional Item Element <additionalItem>

An <additionalItem> element can be used to describe device properties other than configuration properties.

Parent Elements

Element	Description
additionalItem	parent item
additionalItemCategory	vendor specific category of additionalItem elements
additionalItemList	collection of additionalItem elements

Child Elements

Element	Multiplicity	Description
---------	--------------	-------------

(
label	1..n	name of item
help	0..n	additional description
)		
	OR	
(
labelRef	1	pointer to text resource element
helpRef	0..1	pointer to text resource element
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	container for graphical representations
(
const	1..n	constant item value
	OR	
edit	1..n	editable string value
	OR	
enumeration	1..n	enumerated item value
	OR	
range	1..n	(sub)range of item value
	OR	
(
yes	1	true item value
	AND	
no	1	false item value
)		
	OR	
yes	1	true item value
	OR	
no	1	false item value
	OR	
reference	1..n	pointer to another item
	OR	
instanceValue	1	object value of device instance, NOTE: this is not a device type information
)		
specificProperty	0..n	system specific extension
additionalItem	0..n	child item
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique item identifier
additionalItemType	xsd:string	required	type of additional item, the definition of these types is not in the scope of this document
enabled	enumeration	default	indicates if item is initially enabled NO : disabled YES : enabled (default)

5.5 Additional Item Category Element <additionalItemCategory>

The <additionalItemCategory> defines a vendor specific category of <additionalItem> elements.

Parent Elements

Element	Description
additionalItemList	collection of additionalItem elements

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of category
help	0..n	additional descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource element
helpRef	0..1	pointer to text resource element
)		
helpFileRef	0..1	pointer to external documentation
additionalItem	1..n	an additional item

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
enabled	enumeration	default	indicates if category is initially enabled <ul style="list-style-type: none"> NO : disabled YES : enabled (default)

5.6 Additional Item List Element <additionalItemList>

The <additionalItemList> element is a collection of <additionalItem> elements.

Parent Elements

Element	Description
communicationEntity	container describing a networking facility on the device
DeviceManager	container for network specific device properties and objects
processingEntity	container describing a device facility which is not a networking facility

Child Elements

Element	Multiplicity	Description
(
label	1..n	collection name
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource element
helpRef	0..1	pointer to text resource element
)		
helpFileRef	0..1	pointer to external documentation
(
additionalItemCategory	1	vendor specific category
	OR	
additionalItem	1	an additional item
)	1..n	

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
additionalItemsType	xsd:string	required	type of collection, the definition of these types is not in the scope of this document
enabled	enumeration	default	indicates if collection is initially enabled <ul style="list-style-type: none"> • NO : disabled • YES : enabled (default)

5.7 Alignment Element <alignment>

The <alignment> Element provides the alignment of record or array elements within a user defined datatype.

Parent Elements

Element	Description
datatypeTemplateList	list of device specific data types sharing alignment and endianness

Child Elements

The <alignment> element has no child elements.

Attributes

Attribute	Data Type	required	Description
type	xsd:enumeratio n	required	alignment of data types: <ul style="list-style-type: none"> • byte • word • dword • lword

5.8 Application Process Element <ApplicationProcess>

The <ApplicationProcess> element contains network independent descriptions/definitions of device functionalities from a programming/runtime perspective. It allows the integration of external schemas in a device description.

Parent Elements

Element	Description
ProfileBody	description of a device

Child Elements

Element	Multiplicity	Description
externalSchema	0..n	entry point for a schema outside the scope of this specification

Attributes

The <ApplicationProcess> element has no attributes.

5.9 Argument Element <argument>

The <argument> element is used to describe a single argument of a method. For examples see the <method> element.

Parent Elements

Element	Description
argument	parent argument
argumentList	collection of arguments

Child Elements

Element	Multiplicity	Description
(
label	1..n	collection name
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource element
helpRef	0..1	pointer to text resource element
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	container for graphical representations
accessPath	0..1	optional address of argument
datatype	1	data type of argument
(
const	1..n	constant argument value
	OR	
edit	1..n	editable string value
	OR	
enumeration	1..n	enumerated argument value
	OR	
range	1..n	(sub)range of argument value
	OR	
(
yes	1	true argument value
	AND	
no	1	false argument value
)		
	OR	
yes	1	fixed true argument value
	OR	
no	1	fixed false argument value
	OR	
reference	1..n	pointer to another element
	OR	
instanceValue	1	object value of device instance, NOTE: this is not a device type information
)		
specificProperty	0..n	system specific extension
argument	0..n	child argument
instances	0..n	instantiation information

Attributes

Attribute	Data Type	required	Description
argumentType	xsd:string	required	type of argument, enumeration: <ul style="list-style-type: none"> • RESULT - high language style return value of method • IN - input argument (written) • OUT - output argument (read) • INOUT - in/out argument (written and read) • OUTNEGATIVE - argument of negative result message • OUTPOSITIVE - argument of positive result message

5.10 Argument List Element <argumentList>

Parent Elements

Element	Description
methodDescription	description of a device service, function, method, etc.

Child Elements

Element	Multiplicity	Description
argument	1..n	a data object received from or send to a method

Attributes

The <argumentList> element has no attributes.

5.11 Array Type Element <arrayType>

The <arrayType> element can be used to define a typed user defined array. This data type may then be used within a FDCML instance.

Parent Elements

Element	Description
datatypeTemplate	description of a typed user defined data type

Child Elements

Element	Multiplicity	Description
(
help	1..n	additional advice/comment
	OR	
helpRef	1	pointer to text resource
)	0..1	
*	1	any data type element (see chapter 6.1)
subrange	1..n	array dimensions

Attributes

Attribute	Data Type	required	Description
initialValues	xsd:string	required	list of initial values of the array elements (see IEC 61131 2 nd Ed, Table 18 for further details)

5.12 Build Date Element <buildDate>

The <buildDate> element specifies the build date of the facility described by its parent element.

Parent Elements

Element	Description
DeviceIdentity	properties describing the identity of a device or a group of devices
identity	properties describing the identity of a facility in a device

Child Elements

Element	Multiplicity	Description
label	1..n	build date
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.13 Capabilities Element <capabilities>

The <capabilities> element describes device features in a purely textual form.

Parent Elements

Element	Description
DeviceIdentity	properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
characteristicsList	0..1	collection of characteristics
optionsList	0..1	collection of options
standardNormComplianceList	0..1	collection of compliances

Attributes

The <capabilities> element has no attributes.

5.14 Change Element <change>

The <change> element defines a relation between two elements, in which the change of one element value results in the change of the other element value.

Parent Elements

Element	Description
relations	container for relations

Child Elements

Element	Multiplicity	Description
*	1	any data type element (see chapter 6.1)
	OR	
datatypeInstance	1	reference to a data type template

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	XPath compatible Path to another object within the device description

5.15 Channel Element <channel>

The <channel> element describes a physical or logical channel on a device.

Parent Elements

Element	Description
channelList	collection of all channel elements
channel	parent channel

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of channel
help	0..n	additional advice/comment
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	container for graphical representations
accessPath	0..1	system specific device relative access path to channel
specificProperty	0..n	network specific extensions
uses	0..1	XPath to object used by this channel
provides	0..n	XPath to object provided by this channel
channel	0..n	child channel
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
channelType	xsd:string	optional	type identifier of channel, system specific
direction	default	required	data direction <ul style="list-style-type: none"> • I - Input • Q - Output • X - no specific direction
enabled	enumeration	default	indicates, whether this element is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.16 Channel List Element <channelList>

The <channelList> is a collection of <channel> elements.

Parent Elements

Element	Description
deviceStructure	physical device structure

Child Elements

Element	Multiplicity	Description
channel	1..n	physical or logical channel

Attributes

The <channelList> element has no attributes.

5.17 Characteristic Element <characteristic>

The <characteristic> element describes a device characteristic.

Parent Elements

Element	Description
characteristicsList	collection of characteristics

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of communication entity
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
value	1	value description

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier

5.18 Characteristics List Element <characteristicsList>

The <characteristicsList> element is a collection of <characteristic> elements.

Parent Elements

Element	Description
capabilities	descriptions of device features

Child Elements

Element	Multiplicity	Description
characteristic	1..n	description of a device characteristic

Attributes

The <characteristicsList> element has no attributes.

5.19 Communication Entity Element <communicationEntity>

A <communicationEntity> element describes a network facility in a device. A device may consist of multiple communication entities. These communication entities may support different network protocols (bridges, gateways).

Parent Elements

Element	Description
DeviceManager	container of network and device specific properties

Child Elements

Element	Multiplicity	Description
(
label	0..n	name of communication entity
help	0..n	descriptive text
)		
	OR	
(
labelRef	0..1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
identity	0..1	container for properties describing the identity of the network facility
helpFileList	0..1	collection of links to external documentation
toolList	0..1	collection of tools specific for this network facility
pictureList	0..1	collection of graphical representations specific for this network facility
cfgItem	0..1	container of configuration items (communication characteristics)
additionalItemList	0..n	container of extension elements; for future or vendor specific usage
processDataDescriptionList	0..1	collection of process data objects
processDataAssemblyList	0..1	collection of process data assemblies
parameterDescriptionList	0..1	collection of parameter objects
parameterAssemblyList	0..1	collection of parameter assemblies
methodDescriptionList	0..1	collection of method descriptions
logicalConnectionPointList	0..1	collection of logical connection points (communication capabilities) of the network facility
logicalConnectionPointAssemblyList	0..1	collection of connection point assemblies
MAUUsageList	0..1	collection of references to <MAU> elements used by this facility
internalConnectionPointList	0..1	collection of internal connections between multiple communication entities and/or processing entities
slotUsageList	0..1	collection of references to <slot> elements used by this facility
externalSchema	0..n	entry point for a description

		conforming to a schema outside the scope of this specification
--	--	--

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
protocol	xsd:string	required	defines the protocol by which the entity can be reached through a physical network
communicator	enumeration	default	defines, if the entity takes an active part in network communication or not <ul style="list-style-type: none"> • YES (default) • NO
communicationEntityType	enumeration	default	defines the entity type: <ul style="list-style-type: none"> • SLAVE (default) • MASTER • CLIENT • SERVER • PEER (an entity which acts a client and server) • MASTER_SLAVE (an entity which acts as a master and slave) • DEVICEMODULE (an entity which needs a parent to communicate via a network) • PASSIVE (an entity which does not participate in network communication)
communicationProfile	xsd:string	optional	defines the network specific communication profile
enabled	enumeration	default	indicates if entity is initially enabled <ul style="list-style-type: none"> • NO : disabled • YES : enabled (default)

5.20 Configuration Item List Element <cfgItemList>

The <cfgItemList> element is a container for communication attributes or processing attributes. FDCML provides two types of these attributes. A typed item called <dedicatedCfgItem>; the list of valid types has to be defined for a specific system. The second item is the <uncommittedCfgItem>; it is typeless and used to describe device specific behavior, which influences communication attributes or other device attributes. Examples are switches or wire bridges.

Parent Elements

Element	Description
communicationEntity	container describing a networking facility on the device

processingEntity	container describing a device facility which is not a networking facility
------------------	---

Child Elements

Element	Multiplicity	Description
)		
label	0..n	name of container
help	0..n	descriptive text
)		
	OR	
(
labelRef	0..1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
(
itemCategory	1	vendor specific configuration item category
	OR	
dedicatedCfgItem	1	a configuration item with a defined item type
	OR	
uncommittedCfgItem	1	a typeless configuration item
)	1..n	

Attributes

The <cfgItemList> has no attributes.

5.21 Connection Element <connection>

The <connection> defines a connection between two devices of a device group. These connections may be established between physical (i.e. interfaces) and/or logical (i.e. logical connection points) objects of the devices

Parent Elements

Element	Description
connectionList	container of link elements

Child Elements

Element	Multiplicity	Description
specificProperty	0..n	vendor, system or tool specific additional information, attribute or property of connection

Attributes

Attribute	Datatype	required	Description
-----------	----------	----------	-------------

destination	xsd:string	required	endpoint of connection
source	xsd:string	required	starting point of connection

5.22 Connection List Element <connectionList>

The <connectionList> element is a container for defining connections between <ProfileBody> elements within a <ProfilesBody> group.

Parent Elements

Element	Description
ProfilesBody	device group

Child Elements

Element	Multiplicity	Description
connection	1..n	a point-to-point connection between two connectors or logical connection points of two devices

Attributes

The <connectionList> element has no attributes.

5.23 Constant Element <const>

The <const> element defines a constant element value.

Parent Elements

Element	Description
additionalItem	additional item
argument	a data object of a method
dedicatedCfgItem	configuration item of a known item type
modifyValue	instantiation rule
specificProperty	network specific extension
uncommittedCfgItem	typeless configuration item

Child Elements

Element	Multiplicity	Description
*	1	any data type element (see chapter 6.1)
	OR	
datatypeInstance	1	reference to a data type template

Attributes

Attribute	Data Type	required	Description
xml:lang	xsd:language	optional	language identifier, see chapter 6.2 for further details
xlink:type	xsd:string	optional	"simple", XLink type attribute
xlink:href	xsd:anyURI	optional	unified resource identifier
format	xsd:string	optional	formatting information, see chapter 6.4 for further details
unit	xsd:string	optional	unit of value, visibleString

5.24 Datatype Element <datatype>

The <datatype> element defines the data type of a <argument>, <localDataDescription>, <parameterDescription> or <processDataDescription> element. FDCML uses IEC 61158 data types. IEC 61131 and Windows VARIANT data types are provided if applicable.

Parent Elements

Element	Description
argument	data object of a method
localDataDescription	data object produced or consumed locally on the device, thus not transmitted or received through a network
parameterDescription	description of a parameter object
processDataDescription	description of a process data object

Child Elements

Element	Multiplicity	Description
*	1	any data type element (see chapter 6.1)
	OR	
datatypeInstance	1	reference to a data type template

Attributes

The <datatype> element has no attributes.

5.25 Data Type Instance Element <datatypeInstance>

The <datatypeInstance> element is used to reference a data type defined as a Data Type Template.

Parent Elements

Element	Description
change	the actual object value triggers a change of value of another object
const	constant object value
datatype	data type of parent element
edit	freely editable value

Child Elements

The <datatypeInstance> element has no content.

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	name of data type template

5.26 Data Type Template Element <datatypeTemplate>

The <datatypeTemplate> element is used to describe a device specific complex datatype. These templates can be used within other FDCML elements with the <datatypeInstance> element.

Parent Elements

Element	Description
datatypeTemplateList	collection of all data type templates in a device description

Child Elements

Element	Multiplicity	Description
(
label	0..n	name of item
help	0..n	additional advice/comment
)		
	OR	
(
labelRef	0..1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
(
directlyDerivedType	1	from standard data types derived data type
	OR	
enumeratedType	1	enumeration or list of numbered constants
	OR	
subrangeType	1	range or set of subranges
	OR	
arrayType	1	array data type
	OR	
structuredType	1	structure/record data type
)		

Attributes

The <datatypeTemplate> element has no attributes.

5.27 Datatype Template List Element <datatypeTemplateList>

The <datatypeTemplateList> element is a collection of device specific data types. If a device consists of multiple communication entities which have different alignments and/or Endiannesses, more than one <datatypeTemplateList> shall be used.

Parent Elements

Element	Description
DeviceManager	container of network and device specific properties

Child Elements

Element	Multiplicity	Description
alignment	0..1	alignment of the elements of complex data types
endianness	0..1	endianness of the elements of complex data types
datatypeTemplate	1..n	definition of a device specific data type

Attributes

The <datatypeTemplateList> element has no attributes

5.28 Dedicated Configuration Item Element <dedicatedCfgItem>

A <dedicatedCfgItem> describes a certain device behavior, object, attribute, property or setting. This document does not define a list of configuration item types. The definition of these types shall be in the scope of a description of mapping system specific behaviors, objects, attributes, properties or settings to FDCML.

Parent Elements

Element	Description
cfgItemList	container for configuration items
dedicatedCfgItem	parent configuration item
itemCategory	vendor specific category of configuration items

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of item
help	0..n	additional advice/comment
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	container for graphical representations
(
const	1..n	constant item value
	OR	
edit	1..n	editable string value
	OR	
enumeration	1..n	enumerated item value
	OR	
range	1..n	value range of a set of subranges
	OR	
(
yes	1	true value
	AND	
no	1	false value
)		
	OR	
yes	1	true item value
	OR	
no	1	false item value
	OR	
reference	1..n	reference to another item
	OR	
instanceValue	1	object value of device instance, NOTE: this is not a device type information
)	0..1	
specificProperty	0..n	network specific extension
dedicatedCfgItem	0..n	child item
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
dedicatedCfgItemType	xsd:string	required	type of item, system specific
enabled	enumeration	default	indicates, whether this item is initially enabled or not YES (default) NO

5.29 Default Element <default>

The <default> element defines a default value.

Parent Elements

Element	Description
range	definition of a value range

Child Elements

Element	Multiplicity	Description
*	1	any numeric, boolean, user or time data type (see Chapter 6.1)

Attributes

The <default> element has no attributes.

5.30 Default File Element <defaultFile>

The <defaultfile> determines a child device, which is assigned to a slot as default child device.

Parent Elements

Element	Description
slot	slot definition

Child Elements

The <defaultfile> element has no child elements.

Attributes

Attribute	Data Type	required	Description
xlink:type	xsd:string	optional	"simple", XLink type attribute
xlink:href	xsd:anyURI	required	URI of FDCML file of child device

5.31 Delete Entity Element <deleteEntity>

The <deleteEntity> allows the deletion of a child if its parent is instantiated.

NOTE: This element is deprecated and should not be used anymore. Use the externalSchema element with a tool specific schema.

Parent Elements

Element	Description
instances	rules for instance creation of a certain element

Child Elements

The <deleteEntity> element has no child elements.

Attributes

Attribute	Data Type	required	Description
node	xsd:string	required	XPath of child element to be deleted in the instantiated parent element

5.32 Device Family Element <deviceFamily>

The <deviceFamily> element states the family of the device, i.e. I/O or PLC. The list of valid <deviceFamily> values is system specific.

Parent Elements

Element	Description
DeviceIdentity	properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
label	1..n	device family
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by a user <ul style="list-style-type: none"> • YES • NO (default)

5.33 Device Function Element <DeviceFunction>

The <DeviceFunction> element contains network independent descriptions/definitions of device functionalities from a configuration and service perspective.

Parent Elements

Element	Description
ProfileBody	description of a device

Child Elements

Element	Multiplicity	Description
externalSchema	0..n	entry point for a description conforming to a schema outside the scope of this specification

Attributes

The <DeviceFunction> element has no attributes.

5.34 Device Identity Element <DeviceIdentity>

The <DeviceIdentity> element contains network independent properties suitable for identifying a device. Not all properties must have a counterpart on the device.

Parent Elements

Element	Description
ProfileBody	description of a device
ProfilesBody	description of a group of devices

Child Elements

Element	Multiplicity	Description
vendorName	1	name of device vendor
vendorID	0..1	unique ID, identifying the vendor
vendorText	0..1	additional vendor information
deviceFamily	1	defines a superficial device functionality like Digital I/O or Drive. A list of valid values is maintained by the respective bus organization
capabilities	0..1	definition of this element is outside the scope of this specification
productFamily	0..1	vendor specific product family
productName	1	name of device type
productID	0..1	unique ID, identifying the device type
productText	0..1	short description of the device
orderNumber	0..1	order number of the device type
version	0..n	version information
buildDate	0..1	build date of the device
specificationRevision	0..1	revision of the Specification to which this device conforms
instanceName	0..1	instance name of the device; NOTE: this is not a device type information
serialNumber	0..1	serial number of the device; NOTE: this is not a device type information

Attributes

The <DeviceIdentity> has no attributes.

5.35 Device Manager Element <DeviceManager>

The <DeviceManager> element contains all information needed for network configuration and other information not covered by the elements <DeviceIdentity>, <ApplicationProcess> and <DeviceFunction>. An example for this additional information is documentation.

Parent Elements

Element	Description
ProfileBody	description of a device

Child Elements

Element	Multiplicity	Description
importList	0..1	collection for importing partial device descriptions
datatypeTemplateList	0..n	collection of device specific data types; these data types may be used in the <DeviceManager>, <ApplicationProcess> and/or <DeviceFunction> elements
dictionaryList	0..1	collection of references to external text resources
helpFileList	0..1	collection of references to external device documentation
toolList	0..1	collection of device specific tools
pictureList	0..1	collection of graphical device representations
deviceStructure	0..1	container describing the physical structure of the device
localDataDescriptionList	0..1	collection of data objects produces or consumed locally on the device, thus not transmitted via a network
additionalItemList	0..n	container of extension elements; for future or vendor specific usage
communicationEntity	0..n	container describing a networking facility on the device
processingEntity	0..n	container describing a device facility which is not a networking facility
externalSchema	0..n	for extensions outside the scope of this specification

Attributes

The <DeviceManager> element has no attributes.

5.36 Device Structure Element <deviceStructure>

The <deviceStructure> element describes the physical structure of a device. This structure comprises network interfaces, slots and I/O channels.

Parent Elements

Element	Description
DeviceManager	a container of all network and device specific properties of the described device

Child Elements

Element	Multiplicity	Description
channelList	0..1	collection of physical and logical channels
MAUList	0..1	collection of network interfaces
slotList	0..1	collection of slots
indicatorList	0..1	collection of indicators, i.e. device readouts like LEDs or LCDs
externalSchema	0..n	for extensions outside the scope of this specification

Attributes

The <deviceStructure> element has no attributes.

5.37 Dictionary Element <dictionary>

The <dictionary> element defines an external text resource file for a specific language. A resource of this file is identified by the attribute `textID` of the <labelRef> or <helpRef> element. The format of the resource file is defined in chapter 6.3.

Parent Elements

Element	Description
dictionaryList	collection of dictionaries

Child Elements

Element	Multiplicity	Description
file	1	URI of resource file

Attributes

Attribute	Data Type	required	Description
xml:lang	xsd:language	required	language identifier, see chapter 6.2 for further details
dictID	xsd:string	optional	identifier of dictionary, the same identifier has to be used for dictionaries in different languages

5.38 Dictionary List Element <dictionaryList>

The <dictionaryList> element is a collection of <dictionary> elements.

Parent Elements

Element	Description
DeviceManager	container of all network and device specific properties of the described device

Child Elements

Element	Multiplicity	Description
dictionary	1..n	definition of external text resource

Attributes

The <dictionaryList> element has no attributes.

5.39 Directly Derived Type Element <directlyDerivedType>

The <directlyDerivedType> element allows the definition of a device specific directly derived data type.

Parent Elements

Element	Description
datatypeTemplate	device specific data type

Child Elements

Element	Multiplicity	Description
help	0..n	additional advice/comment
	OR	
helpRef	1	pointer to text resource
*	1	any data type element (see chapter 6.1)

Attributes

Attribute	Data Type	required	Description
initialValue	xsd:string	required	initial value of data type

5.40 Disable Element <disable>

The <disable> element defines a disable relation. The targeted object is inactive or disabled if the parent object of the relation is set to the described value.

Parent Elements

Element	Description
relations	container for relations

Child Elements

The <disable> element has no child elements.

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	XPath to element to be disabled

5.41 Edit Element <edit>

The <edit> element indicates, that the associated string value can be edited by an user.

Parent Elements

Element	Description
additionalItem	additional item
argument	a data object of a method
dedicatedCfgltem	configuration item of a known item type
modifyValue	instantiation rule
specificProperty	for further expansion
uncommittedCfgltem	typeless configuration item

Child Elements

Element	Multiplicity	Description
visibleString	1	
	OR	
octetString	1	
	OR	
bitstring	1	
	OR	
IPV4Address	1	
	OR	
IPV6Address	1	
	OR	
datatypeInstance	1	reference to a data type template

Attributes

Attribute	Data Type	required	Description
xml:lang	xsd:language	optional	language identifier, see chapter 6.2 for further details
xlink:type	xsd:string	optional	"simple", XLink type attribute
xlink:href	xsd:anyURI	optional	unified resource locator
format	xsd:string	optional	formatting information, see chapter 6.4 for further details
unit	xsd:string	optional	unit of value, visibleString

5.42 Enable Element <enable>

The <enable> element defines a enable relation. The targeted object is active or enabled if the parent object of the relation is set to the described value.

Parent Elements

Element	Description
relations	container for relations

Child Elements

The <enable> element has no child elements.

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	XPath to element to be enabled

5.43 Endianness Element <endianness>

The <endianness> element defines the Endianness of device specific data types and thus indirectly the Endianness of the device.

Parent Elements

Element	Description
datatypeTemplateList	list of device specific data types

Child Elements

The <endianness> element has no child elements.

Attributes

Attribute	Data Type	required	Description
type	xsd:enumeration	required	endianness of data types: <ul style="list-style-type: none"> • little • big

5.44 Enumerated Type Element <enumeratedType>

The <enumeratedType> element allows the definition of a device specific enumerated data type. This element allows the description of enumerations as well as lists of named constants (C-style enumerations).

Parent Elements

Element	Description
datatypeTemplate	device specific data type

Child Elements

Elements	Multiplicity	Description
(
help	0..n	additional advice/comment
	OR	
helpRef	0..1	pointer to text resource
)		
enumeratedValue	1..n	enumerated value

Attributes

Attribute	Data Type	required	Description
initialValue	xsd:string	optional	default value of the enumeration

5.45 Enumerated Value Element <enumeratedValue>

The <enumeratedValue> is used to describe a single value in an <enumeratedType>.

Parent Elements

Element	Description
enumeratedType	device specific enumeration

Child Elements

Elements	Multiplicity	Description
(
label	1..n	name of item
help	0..n	additional advice/comment
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
*	0..1	any data type element (see chapter 6.1)

Attributes

The <enumeratedValue> element has no attributes.

5.46 Enumeration Element <enumeration>

The <enumeration> element allows the definition of an enumerated value.

Parent Elements

Element	Description
additionalItem	additional item
argument	data object of a method
dedicatedCfgItem	configuration item of a known type
modifyValue	instantiation information, a value has to be modified by a user
specificProperty	network specific extension
uncommittedCfgItem	typeless configuration item

Child Elements

Elements	Multiplicity	Description
(
label	1..n	name of enumerated value
	OR	
labelRef	1	pointer to text resource
)	1	
(
any numeric, Boolean, string or user data type	1	see chapter 6.1
)		
relations	0..1	relations with other elements

Attributes

Attribute	Data Type	required	Description
default	enumeration	default	indicates the default enumeration <ul style="list-style-type: none"> • YES • NO (default)
multipleSelection	enumeration	optional	indicates, whether the described object may have one or more of the stated values <ul style="list-style-type: none"> • YES (default) - object can have one or more of the given values if the attribute is not present, the object can only have one of the given values

5.47 External Schema Element <externalSchema>

The <externalSchema> element is an entry point for a description conforming to an arbitrary external schema.

Parent Elements

Element	Description
ApplicationProcess	container of network independent descriptions/definition of device functionalities from the runtime perspective.
communicationEntity	communication entity
DeviceFunction	container describing the functional and operational behavior of a device
DeviceManager	container of all network and device specific properties of the described device
deviceStructure	physical device structure
instances	instantiation information
processingEntity	container describing a device

	facility which is not a networking facility
--	---

Child Elements

Any elements of the included namespace.

Attributes

The <externalSchema> element has no attributes.

5.48 File Element <file>

The <file> element states the file name of an external resource. It may be a dictionary, additional documentation or another FDCML file.

Parent Elements

Element	Description
dictionary	definition of an external text resource
helpFile	definition of external documentation
importList	collection of partial device description
slot	description of a device slot

Child Elements

The <file> element has no child elements.

Attributes

Attribute	Data Type	required	Description
xlink:type	xsd:string	optional	"simple", XLink type attribute
xlink:href	xsd:anyURI	required	file URI

5.49 Gain Element <gain>

The <gain> element specifies a scaling factor by which an actual value is multiplied to form a scaled value:

$$x_{scale} = offset + x_{actual} * gain$$

The data type of the <gain> and <offset> element have to be the same. They determine the data type to be used for visualization of this object.

Parent Elements

Element	Description
range	valid range of an object value

Child Elements

Any numeric or user data type or numeric user defined data type (see chapter 6.1).

Attributes

The <gain> element has no attributes.

5.50 Help Element <help>

The <help> element provides additional advice or comment for an element.

Parent Elements

Element	Description
additionalItem	additional item
additionalItemCategory	vendor specific category of additional items
additionalItemList	collection of additional item elements
argument	data object of a method
arrayType	device specific array data type
cfgItemList	container of configuration items
channel	logical or physical channel
communicationEntity	communication entity
datatypeTemplate	device specific data type
dedicatedCfgItem	configuration item of a known item type
directlyDerivedType	device specific directly derived data type
enumeratedType	device specific enumerated data type
enumeratedValue	legal value of a device specific data type
itemCategory	vendor specific category of configuration items
LED	description of a LED on the device
LEDState	possible state of a LED
localDataCategory	vendor specific category of local data description elements
localDataDescription	description of a local data object
localDataDescriptionList	collection of all localDataDescription elements of a device
logicalConnectionPoint	logical connection point
logicalConnectionPointAssembly	group of logical connection points
logicalConnectionPointAssemblyList	collection of logical connection point assemblies
logicalConnectionPointList	collection of logical connection points
MAU	network interface
methodCategory	vendor specific category of method descriptions
methodDescription	description of a method
methodDescriptionList	collection of all method descriptions
no	false value
parameterAssembly	group of parameter objects
parameterAssemblyCategory	vendor specific category of parameter groups
parameterAssemblyList	collection of all parameter groups
parameterCategory	vendor specific category of parameters
parameterDescription	description of a parameter object
parameterDescriptionList	container for parameter objects
picture	graphical representation of a device object, property, part or element
processDataAssembly	group of process data objects
processDataAssemblyCategory	vendor specific category of process data object groups
processDataAssemblyList	collection of all process data objects
processDataCategory	vendor specific category of process data objects
processDataDescription	description of a process data object
processDataDescriptionList	container for process data objects
processingEntity	container describing a device facility which is not a networking facility

slot	slot definition
specificProperty	system or vendor specific extension
structuredType	device specific structured data type
subrangeType	device specific range data type
subrangeVarDeclaration	subrange in a device specific structured data type
uncommittedCfgItem	typeless configuration item
varDeclaration	element of a device specific structured data type
yes	true value

Child Elements

It provides a help text for the parent element. Type of content is xsd:string.

Attributes

Attribute	Data Type	required	Description
xml:lang	xsd:language	required	language identifier, see chapter 6.2

5.51 Help File Element <helpFile>

The <helpFile> is a definition of a device documentation or help file.

Parent Elements

Element	Description
helpFileList	collection of device documentation or help files

Child Elements

Element	Multiplicity	Description
file	1	URI of documentation or help file

Attributes

Attribute	Data Type	required	Description
xml:lang	xsd:language	required	language identifier, see chapter 6.2
helpFileID	xsd:string	optional	identifier of help file. The same identifier is used for help files in different languages

5.52 Help File List Element <helpFileList>

The <helpFileList> is a collection of external device description or help files.

Parent Elements

Element	Description
communicationEntity	communication entity
DeviceManager	container of all network and device specific properties of

	the described device
processingEntity	container describing a device facility which is not a networking facility

Child Elements

Element	Multiplicity	Description
helpFile	1..n	definition of a documentation or help file

Attributes

The <helpFileList> has no attributes.

5.53 Help File Reference Element <helpFileRef>

The <helpFileRef> Element provides a pointer to a distinctive position in a documentation or help file defined with a <helpFile> element.

Parent Elements

Element	Description
additionalItem	additional item
additionalItemCategory	vendor specific category of additional items
additionalItemList	collection of additional item elements
argument	data object of a method
cfgItemList	container of configuration items
channel	logical or physical channel
communicationEntity	communication entity
datatypeTemplate	device specific data type
dedicatedCfgItem	configuration item of a known item type
enumeratedValue	legal value of a device specific enumerated data type
itemCategory	vendor specific category of configuration items
LED	description of a LED of the device
LEDState	possible state of a LED
localDataCategory	vendor specific category of local data objects
localDataDescription	description of a local data object
localDataDescriptionList	collection of all localDataDescription elements
logicalConnectionPoint	logical connection point
logicalConnectionPointAssembly	group of logical connection points
logicalConnectionPointAssemblyList	collection of logical connection point assemblies
logicalConnectionPointList	collection of logical connection points
MAU	network interface
methodCategory	vendor specific category of method descriptions
methodDescription	description of a method
methodDescriptionList	collection of all method descriptions
no	false value
parameterAssembly	group of parameter objects
parameterAssemblyCategory	vendor specific category of parameter groups
parameterAssemblyList	collection of all parameter groups
parameterCategory	vendor specific category of parameters
parameterDescription	description of a parameter object
parameterDescriptionList	container for parameters
picture	graphical representation of a device object, property, part or element
processDataAssembly	group of process data objects
processDataAssemblyCategory	vendor specific category of process data object groups
processDataAssemblyList	collection of all process data objects
processDataCategory	vendor specific category of process data objects
processDataDescription	description of a process data object
processDataDescriptionList	container for process data objects
processingEntity	container describing a device facility which is not a networking facility
slot	slot definition
specificProperty	system or vendor specific extension
subrangeVarDeclaration	range data type of a device specific data type structure
uncommittedCfgItem	typeless configuration item
varDeclaration	element of a device specific sstructured data type

yes	true value
-----	------------

Child Elements

The <helpFileRef> element has no child elements.

Attributes

Attribute	Data Type	required	Description
helpFileID	xsd:string	optional	identifier of help file if more than one help file is used, help files differing in language share the same ID
helped	xsd:string	optional	distinctive position within a help file. The format depends on the format of the help file

5.54 Help Reference Element <helpRef>

The <helpRef> element is a pointer to an external defined text resource. Text resources are imported with the <dictionary> element.

Parent Elements

Element	Description
additionalItem	additional item
additionalItemCategory	vendor specific category of additional items
additionalItemList	collection of additional item elements
argument	data object of a method
arrayType	device specific array data type
cfgItemList	container of configuration items
channel	logical or physical channel
communicationEntity	communication entity
datatypeTemplate	device specific data type
dedicatedCfgItem	configuration item of a known item type
directlyDerivedType	device specific directly derived data type
enumeratedType	device specific enumerated data type
enumeratedValue	legal value of a device specific data type
itemCategory	vendor specific category of configuration items
LED	description of a LED on the device
LEDState	possible state of a LED
localDataCategory	vendor specific category of local data description elements
localDataDescription	description of a local data object
localDataDescriptionList	collection of all localDataDescription elements of a device
logicalConnectionPoint	logical connection point
logicalConnectionPointAssembly	group of logical connection points
logicalConnectionPointAssemblyList	collection of logical connection point assemblies
logicalConnectionPointList	collection of logical connection points
MAU	network interface
methodCategory	vendor specific category of method descriptions
methodDescription	description of a method
methodDescriptionList	collection of all method descriptions
no	false value
parameterAssembly	group of parameter objects
parameterAssemblyCategory	vendor specific category of parameter groups
parameterAssemblyList	collection of all parameter groups
parameterCategory	vendor specific category of parameters
parameterDescription	description of a parameter object
parameterDescriptionList	container for parameter objects
picture	graphical representation of a device object, property, part or element
processDataAssembly	group of process data objects
processDataAssemblyCategory	vendor specific category of process data object groups
processDataAssemblyList	collection of all process data objects
processDataCategory	vendor specific category of process data objects
processDataDescription	description of a process data object
processDataDescriptionList	container for process data objects
processingEntity	container describing a device facility which is not a networking facility

slot	slot definition
specificProperty	system or vendor specific extension
structuredType	device specific structured data type
subrangeType	device specific range data type
subrangeVarDeclaration	subrange in a device specific structured data type
uncommittedCfgItem	typeless configuration item
varDeclaration	element of a device specific structured data type
yes	true value

Child Elements

The <helpRef> element has no child elements.

Attributes

Attribute	Data Type	required	Description
textID	xsd:string	required	identifier of text resource
dictID	xsd:string	optional	identifier of text resource file if more than one dictionary is used

5.55 Hotspot Element <hotspot>

The <hotspot> element defines an active area on a graphical representation of a device object or property.

Parent Elements

Element	Description
hotspotList	collection of hotspot elements

Child Elements

The <hotspot> element has no child elements.

Attributes

Attribute	Data Type	required	Description
xPos	xsd:nonNegativeIntege r ¹⁾	required	relative horizontal position
yPos	xsd:nonNegativeIntege r ¹⁾	required	relative vertical position
hotElement	xsd:string	required	XPath to element

¹⁾ maximum value is 100

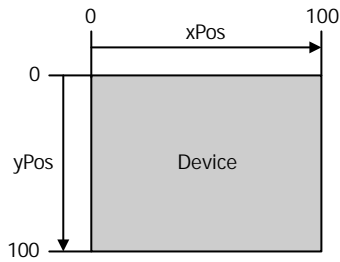


Figure 5-1: xPos/yPos Attribute

5.56 Hotspot List Element <hotspotList>

The <hotspotList> element is a collection for <hotspot> elements.

Parent Elements

Element	Description
picture	graphical representation of an element

Child Elements

Element	Multiplicity	Description
hotspot	1..n	definition of an active area on a graphical representation

Attributes

The <hotspotList> element has no attributes.

5.57 IAS Interface Type Element <IASInterfaceType>

The <IASInterfaceType> element states the IAS interfaces.

Parent Elements

Element	Description
ProfileHeader	general profile information

Child Elements

Type of content is xsd:string. Valid values are:

CSI Communication Services Interface
 HCI Human/Computer Interface
 ISI Information Services Interface
 API Application Program Interface
 CMI Configuration Management Interface
 ESI Engineering Support Interface
 FSI Facility Services Interface
 MTI Material Transport Interface
 SEI Safety and Environment Interface
 USI Utility Services Interface
 or

???? an arbitrary string consisting of four characters

see ISO/IEC TR 14252 and ISO 15745-1 Annex A for further details

Attributes

The <IASInterfaceType> element has no attributes.

5.58 Identity Element <identity>

The <identity> element is used to provide identity information for certain FDCML elements.

Note: It is recommended to use the same identity element in Schemas included in the <ApplicationProcess> and/or <DeviceFunction> elements.

Parent Elements

Element	Description
communicationEntity	container describing a networking facility on the device
processingEntity	container describing a device facility which is not a networking facility

Child Elements

Element	Multiplicity	Description
vendorName	1	name of vendor
typeName	1	type of parent element
version	0..n	version information
buildDate	1	build date of facility described by parent element
specificationRevision	0..1	revision of the specification to which the parent facility conforms
instanceName	0..1	instance name of parent facility; NOTE: this is not a type information

Attributes

The <identity> element has no attributes.

5.59 Import List Element <importList>

The <importList> element is used to define partial or complete profiles which are to be reused in the actual profile. It may be possible that a FDCML enabled application is unable to resolve the importing and a preprocessor is to be used.

Parent Elements

Element	Description
DeviceManager	container for network specific device properties and objects

Child Elements

Element	Multiplicity	Description
file	1..n	definition of external resource to be imported

Attributes

The <importList> element has no attributes.

5.60 Indicator List Element <indicatorList>

The <indicatorList> is a container for descriptions of device readouts. Currently only LEDs are supported.

Parent Elements

Element	Description
deviceStructure	physical device structure

Child Elements

Element	Multiplicity	Description
LEDList	0..1	collection of LED descriptions

Attributes

The <indicatorList> element has no attributes.

5.61 Instance Name Element <instanceName>

The <instanceName> provides the instance name of the described parent facility.

NOTE: this is not a device type information.

Parent Elements

Element	Description
DeviceIdentity	properties describing the identity of a device or a group of devices
identity	properties describing the identity of a facility in a device

Child Elements

Element	Multiplicity	Description
label	1..n	name of device instance
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by a user

			<ul style="list-style-type: none"> • YES • NO (default)
--	--	--	---

5.62 Instances Element <instances>

The <instances> element provides information how to instantiate certain elements.

Parent Elements

Element	Description
additionalItem	additional item
argument	data object of a method
channel	a logical or physical channel
dedicatedCfgItem	configuration item of a known item type
internalConnectionPoint	a single internal connection point
localDataDescription	data object consumed or produced locally on the device, thus not transmitted or received through a network
logicalConnectionPoint	logical connection point
logicalConnectionPointAssembly	group of logical connection points
MAU	network interface
methodDescription	description of a method
parameterAssembly	group of parameter descriptions
parameterDescription	description of a parameter object
processDataAssembly	group of process data descriptions
processDataDescription	description of a process data object
slot	slot
uncommittedCfgItem	typeless configuration item

Child Elements

Element	Multiplicity	Description
(
recalcValue	1	defines a value which is automatically calculated by a tool if the parent element is instantiated
	OR	
modifyValue	1	defines user actions which are to be performed if the parent element is instantiated
	OR	
recalcElement	1	defines a child element which is calculated by a tool if the parent element is instantiated
	OR	
modifyElement	1	defines user actions which are to be performed on a child if the parent element is instantiated
	OR	
deleteElement	1	defines an element which is to be deleted if a parent element is instantiated, for creating new elements use the modify/recalc elements above
)	1..n	
	OR	
externalSchema	1..n	entry point for a schema outside the scope of this specification

NOTE: the elements <recalcValue>, <modifyValue>, <recalcElement>, <modifyElement> and <deleteElement> are deprecated and provided for backward compatibility, only. These elements should not be used anymore. Use external tool specific schemas instead.

Attributes

Attribute	Data Type	required	Description
maxInstances	xsd:nonNegativeInteger	optional	maximum number of possible instances

5.63 Instance Value Element <instanceValue>

The <instanceValue> element defines the value of an instance. It can be used to build a device instance description based on the same structure as a device type description.

Parent Elements

Element	Description
additionalItem	additional item
argument	data object of a method
buildDate	build date of device or device facility
dedicatedCfgItem	configuration item of a known item type
deviceFamily	family of the device
instanceName	instance name of device or device facility
modifyValue	instantiation rule
orderNumber	order number of the device
productFamily	vendor specific family of the device
productID	vendor specific ID of device type
productName	name or designation of device type
productText	short textual description of the device
specificationRevision	revision of specification to which the device or device facility conforms
specificProperty	for further expansion
typeName	type designation of parent element
uncommittedCfgItem	typeless configuration item
vendorID	OUI of vendor
vendorName	name of vendor
vendorText	additional vendor information
version	version of device or device facility

Child Elements

Type of content is xsd:string.

NOTE: If the content in an instance is empty, a xsi:nil='true' attribute has to be added.

Attributes

The <instanceValue> element has no attributes.

5.64 Internal Connection Point Element <internalConnectionPoint>

The <internalConnectionPoint> defines a connection between two communication entities, two processing entities or between a communication entity and a resource entity.

Parent Elements

Element	Description
internalConnectionPointList	collection for internal connection points

Child Elements

Element	Multiplicity	Description
uses	0..1	XPath to element used by this internal connection
specificProperty	0..n	for future extensions or device, system or vendor specific information
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
ref	xsd:string	required	XPath to another internal connection point
enabled	enumeration	default	indicates, whether this element is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.65 Internal Connection Point List Element <internalConnectionPointList>

The <internalConnectionPointList> element is a collection of <internalConnectionPoint> elements of a communication entity.

Parent Elements

Element	Description
communicationEntity	Container describing a networking facility on the device
processingEntity	container describing a device facility which is not a networking facility

Child Elements

Element	Multiplicity	Description
internalConnectionPoint	1..n	a single internal connection point

Attributes

The <internalConnectionPointList> element has no attributes.

5.66 ISO 15745 Edition Element <ISO15745Edition>

The <ISO15745Edition> element states the edition of ISO 15745 to which the current profile complies.

Parent Elements

Element	Description
ISO15745Reference	ISO 15745 part, edition and technology

Child Elements

Type of content is xsd:positiveInteger.

Attributes

The <ISO15745Edition> element has no attributes.

5.67 ISO 15745 Part Element <ISO15745Part>

The <ISO15745Part> element states the part of ISO 15745 to which the current profile complies.

Parent Elements

Element	Description
ISO15745Reference	ISO 15745 part, edition and technology

Child Elements

Type of content is xsd:positiveInteger.

Attributes

The <ISO15745Part> element has no attributes.

5.68 ISO 15745 Reference Element <ISO15745Reference>

States the ISO 15745 part, edition and technology, to which this description conforms.

Parent Elements

Element	Description
ProfileHeader	generic profile information

Child Elements

Element	Multiplicity	Description
ISO15745Part	1	part of ISO 15745
ISO15745Edition	1	edition of ISO 15745
ProfileTechnology	1	technology in the above mentioned part

Attributes

The <ISO15745Reference> element has no attributes.

5.69 Item Category Element <itemCategory>

The <itemCategory> element allows vendor specific structuring of configuration items.

Parent Elements

Element	Description
cfgItemList	container for configuration items

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of category
help	0..n	additional advice
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
(
dedicatedCfgItem	1	configuration item with a known item type
	OR	
uncommittedCfgItem	1	typeless configuration item
)	1..n	

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
enabled	enumeration	default	indicates, if category is initially enabled <ul style="list-style-type: none"> • YES (default) • NO

5.70 Label Element <label>

The <label> element gives its parent element a designation.

Parent Elements

Element	Description
additionalItem	an additional item
additionalItemCategory	a vendor specific category of additional items
additionalItemList	a collection of additional item elements
argument	data object of a method
buildDate	build date of the device
cfgItemList	container of configuration items
channel	a logical or physical channel
communicationEntity	a communication entity
datatypeTemplate	device specific data type declaration
dedicatedCfgItem	a configuration item of a known item type
deviceFamily	superficial device functionality
enumeratedValue	legal value of a device specific enumerated data type
enumeration	an enumerated value
instanceName	name of device instance
itemCategory	a vendor specific category of configuration items
LED	description of a device LED
LEDState	possible state of a LED
localDataCategory	a vendor specific category of local data objects
localDataDescription	description of a local data object
localDataDescriptionList	collection of localDataDescription elements
logicalConnectionPoint	a logical connection point
logicalConnectionPointAssembly	group of logical connection points
logicalConnectionPointAssemblyList	collection of logical connection point assemblies
logicalConnectionPointList	collection of logical connection points
MAU	a MAU
methodCategory	a vendor specific category of method descriptions
methodDescription	description of a method
methodDescriptionList	collection of all method descriptions
no	false value
orderNumber	order number, catalog number, ... of the device
parameterAssembly	a group of parameter objects
parameterAssemblyCategory	a vendor specific category of parameter groups
parameterAssemblyList	collection of all parameter groups
parameterCategory	a vendor specific category of parameters
parameterDescription	description of a parameter object
parameterDescriptionList	container for parameters
picture	a graphical representation of a device object, property, part or element
processDataAssembly	a group of process data objects
processDataAssemblyCategory	a vendor specific category of process data object groups
processDataAssemblyList	collection of all process data objects
processDataCategory	a vendor specific category of process data objects
processDataDescription	description of a process data object
processDataDescriptionList	container for process data objects

productFamily	vendor specific family
productName	name of the device
productText	additional device information
processingEntity	container describing a device facility which is not a networking facility
slot	a slot definition
specificationRevision	specification to which this device conforms
specificProperty	system or vendor specific extension
subrangeVarDeclaration	range of an element of a device specific data type structure
uncommittedCfgItem	a typeless configuration item
varDeclaration	element of a device specific data type structure
vendorID	IEEE OUI
vendorName	name of device manufacturer or vendor
vendorText	additional vendor information
version	device version
yes	true value

Child Elements

Type of content is xsd:string.

Attributes

Attribute	Data Type	required	Description
xml:lang	xsd:language	required	language identifier, see chapter 6.2
xlink:type	xsd:string	optional	"simple", XLink type attribute
xlink:href	xsd:anyURI	optional	unified resource locator

5.71 Label Reference Element <labelRef>

The <labelRef> element is a pointer to a external defined text resource. Text resources are imported with the <dictionary> element.

Parent Elements

Element	Description
additionalItem	an additional item
additionalItemCategory	a vendor specific category of additional items
additionalItemList	a collection of additional item elements
argument	data object of a method
buildDate	build date of the device
cfgItemList	container of configuration items
channel	a logical or physical channel
communicationEntity	a communication entity
datatypeTemplate	device specific data type declaration
dedicatedCfgItem	a configuration item of a known item type
deviceFamily	superficial device functionality
enumeratedValue	legal value of a device specific enumerated data type
enumeration	an enumerated value
instanceName	name of device instance
itemCategory	a vendor specific category of configuration items
LED	description of a device LED
LEDState	possible state of a LED
localDataCategory	a vendor specific category of local data objects
localDataDescription	description of a local data object
localDataDescriptionList	collection of localDataDescription elements
logicalConnectionPoint	a logical connection point
logicalConnectionPointAssembly	group of logical connection points
logicalConnectionPointAssemblyList	collection of logical connection point assemblies
logicalConnectionPointList	collection of logical connection points
MAU	a MAU
methodCategory	a vendor specific category of method descriptions
methodDescription	description of a method
methodDescriptionList	collection of all method descriptions
no	false value
orderNumber	order number, catalog number, ... of the device
parameterAssembly	a group of parameter objects
parameterAssemblyCategory	a vendor specific category of parameter groups
parameterAssemblyList	collection of all parameter groups
parameterCategory	a vendor specific category of parameters
parameterDescription	description of a parameter object
parameterDescriptionList	container for parameters
picture	a graphical representation of a device object, property, part or element
processDataAssembly	a group of process data objects
processDataAssemblyCategory	a vendor specific category of process data object groups
processDataAssemblyList	collection of all process data objects
processDataCategory	a vendor specific category of process data objects
processDataDescription	description of a process data object
processDataDescriptionList	container for process data objects

productFamily	vendor specific family
productName	name of the device
productText	additional device information
processingEntity	container describing a device facility which is not a networking facility
slot	a slot definition
specificationRevision	specification to which this device conforms
specificProperty	system or vendor specific extension
subrangeVarDeclaration	range of an element of a device specific data type structure
uncommittedCfgItem	a typeless configuration item
varDeclaration	element of a device specific data type structure
vendorID	IEEE OUI
vendorName	name of device manufacturer or vendor
vendorText	additional vendor information
version	device version
yes	true value

Child Elements

The <labelRef> element has no child elements.

Attributes

Attribute	Data Type	required	Description
textID	xsd:string	required	ID of text resource
dictID	xsd:string	optional	ID of dictionary if more than one dictionary is used
xlink:type	xsd:string	optional	"simple", XLink type attribute
xlink:href	xsd:anyURI	optional	unified resource locator

5.72 LED Element <LED>

The <LED> element is a description of a device LED.

Parent Elements

Element	Description
LEDList	collection of all LED elements

Child Elements

Element	Multiplicity	Description
---------	--------------	-------------

(
label	1..n	name of category
help	0..n	additional advice
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
LEDState	1..n	description of a LED state
specificProperty	0..n	extensions outside the scope of this specification

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
LEDType	enumeration	required	type of LED: <ul style="list-style-type: none"> • IOStatus • IODiagnostic • DeviceStatus • DeviceDiagnostic • CommStatus • CommDiagnostic
enabled	enumeration	default	indicates, whether this object is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.73 LED List Element <LEDList>

The <LEDList> element is a collection of LED descriptions.

Parent Elements

Element	Description
indicatorList	container for all device read out descriptions

Child Elements

Element	Multiplicity	Description
LED	1..n	description of a device LED

Attributes

The <LEDList> element has no attributes.

5.74 LED State Element <LEDState>

The <LEDState> element describes a single state of a LED, i.e. on/off; color and blinking frequency.

Parent Elements

Element	Description
LED	description of a device LED

Child Elements

Element	Multiplicity	Description
(
(
label	1..n	name of category
help	0..n	additional advice
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
)	0..1	
specificProperty	0..n	system specific extension

Attributes

Attribute	Data Type	required	Description
LEDCondition	enumeration	required	condition of LED in this state: <ul style="list-style-type: none"> • ON • OFF
LEDColor	enumeration	optional	color of LED in this state: <ul style="list-style-type: none"> • GREEN • YELLOW • RED • ORANGE • BLUE • WHITE
LEDFrequency	xsd:float	optional	blink frequency of LED in current state in Hz;continuous or off when omitted
LEDFlashCount	xsd:nonNegativeInteger	optional	number of flashes
ref	xsd:string	optional	XPath to related element (i.e. processDataItem in the case of IOState LEDs)

5.75 Local Data Category Element <localDataCategory>

The <localDataCategory> element is a vendor specific category of local data objects.

Parent Elements

Element	Description
localDataDescriptionList	a collection of local data objects

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of category
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
localDataDescription	1..n	description of a local data object

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
enabled	enumeration	default	indicates, whether this object is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.76 Local Data Description Element <localDataDescription>

A <localDataDescription> element describes a data object consumed or produced locally on the device, thus not transmitted or received through a network.

Parent Elements

Element	Description
localDataDescription	a parent local data object
localDataCategory	a vendor specific category of local data objects
localDataDescriptionList	a collection of local data objects

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of local data object
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	container for graphical representations
accessPath	1	implementation specific address of local data object within the device
datatype	1	data type of the local data object
specificProperty	0..n	extensions outside the scope of this specification
uses	0..1	XPath to element used by this local data object
provides	0..n	XPath to element provided by this local data item
localDataDescription	0..n	a child object
instances	0..1	instantiation rules

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
direction	enumeration	required	data direction I - Input Q - Output
localDataDescriptionType	xsd:string	required	object type
enabled	enumeration	default	indicates, whether this object is initially enabled or not YES (default) NO

5.77 Local Data Description List Element <localDataDescriptionList>

The <localDataDescriptionList> is a collection of <localDataDescription> elements of a device.

Parent Elements

Element	Description
DeviceManager	a container of all network and device specific properties of the described device

Child Elements

Element	Multiplicity	Description
(
label	0..n	name of collection
help	0..n	descriptive text
)		
	OR	
(
labelRef	0..1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
(
localDataCategory	1	vendor specific category
	OR	
localDataDescription	1	a local data object
)	1..n	

Attributes

The <localDataDescriptionList> element has no attributes.

5.78 Logical Connection Point Element <logicalConnectionPoint>

The <logicalConnectionPoint> element defines the possibility of a connection on a <communicationEntity> by which it can be accessed through a certain communication mechanism. A <logicalConnectionPoint> provides a (sub)set of communication objects (<processDataDescription>, <parameterDescription>, <methodDescription>) residing in a <communicationEntity>.

Parent Elements

Element	Description
logicalConnectionPointList	collection of all logical connection points of a communication Entity

Child Elements

Element	Multiplicity	Description
(
label	1..n	name
help	0..n	additional advice
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	optional container of graphical representations
specificProperty	0..n	optional network specific property which could not mapped to other child elements or attributes of a logicalConnectionPoint element
uses	0..1	reference to connector which enables the logical connection point to gain access to a physical network
provides	1..n	reference to communication objects which are made available through this logical connection point
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
logicalConnectionPointType	xsd:string	required	type of logical connection, system specific
role	enumeration	required	role of communication entity when accessed via this logical connection point <ul style="list-style-type: none"> • CLIENT • SERVER • PEER • PUBLISHER • SUBSCRIBER • PUBLISHERSUBSCRIBER
maxRelationships	xsd:nonNegativeInteger	default	maximum number of connections, default is '1'
newLevel	enumeration	default	indicates, if the connection point opens a new structural level <ul style="list-style-type: none"> • NO (default) • YES
enabled	enumeration	default	indicates, whether this connection point is

			initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO
--	--	--	--

5.79 Logical Connection Point Assembly Element <logicalConnectionPointAssembly>

The <logicalConnectionPointAssembly> defines a group of logical connection points. The meaning of this grouping may be system specific.

Note: Not all systems may support assemblies of connection points.

Parent Elements

Element	Description
logicalConnectionPointAssemblyList	Container of all connection point assemblies in a communication entity

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
specificProperty	0..n	system specific extension
uses	0..1	reference to connector which enables the logical connection point assembly to gain access to a physical network
provides	1..n	XPath to <logicalConnectionPoint> elements composing this assembly
instances	0..1	instatiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
logicalConnectionPointAssemblyType	xsd:string	required	type of logical connection, system specific
enabled	enumeration	default	indicates, whether this connection point is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.80 Logical Connection Point Assembly List Element <logicalConnectionPointAssemblyList>

The <logicalConnectionPointAssemblyList> is a collection of all connection point assemblies of a communication entity.

Parent Elements

Element	Description
communicationEntity	a communication entity
processingEntity	container describing a device facility which is not a networking facility

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of MAU
help	0..n	descriptive text
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
logicalConnectionPointAssembly	1..n	assembly of connection points

Attributes

The <logicalConnectionPointAssemblyList> element has no attributes.

5.81 Logical Connection Point List Element <logicalConnectionPointList>

The <logicalConnectionPointList> element is a collection of all logical connection points of a <communicationEntity> element.

Parent Elements

Element	Description
communicationEntity	a communication entity
processingEntity	container describing a device facility which is not a networking facility

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of MAU
help	0..n	descriptive text
)	0..1	
	OR	
(
labelRef	1..n	pointer to text resource
helpRef	0..n	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
logicalConnectionPoint	1..n	a logical connection point

Attributes

The <logicalConnectionPointList> element has no attributes.

5.82 MAU Element <MAU>

The <MAU> element describes an interface by which a device can be connected to a communication network.

Parent Elements

Element	Description
MAUList	collection of all device MAU elements

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of MAU
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	collection of graphical representations
specificProperty	0..n	for future extensions
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
protocol	xsd:string	required	defines the protocol run by the MAU
interfaceType	xsd:string	required	provides additional information on the type of the MAU
MAUType	xsd:string	optional	vendor specific MAU Type identifier internal - for MAUs used by internal connections
newLevel	enumeration	default	indicates, if the connection point opens a new structural level NO (default) YES
directlyConnected	enumeration	required	defines if other devices are connected directly to this MAU YES NO
sequenceNumber	xsd:nonNegativeInteger	default	identification of the MAU, starting with 1, separately numbered for each direction default is '1'
direction	enumeration	required	defines the logical direction of the data flow through this MAU INOUT: transmit and receive IN: receive and loopback circuit OUT: transmit and loopback circuit IN_UNI: receive only OUT_UNI: transmit only
enabled	enumeration	default	indicates, whether this connection point is initially enabled or not YES (default) NO

5.83 MAU List Element <MAUList>

The <MAUList> element is a collection of all <MAU> elements of a device.

Parent Elements

Element	Description
deviceStructure	physical device structure

Child Elements

Element	Multiplicity	Description
MAU	1..n	description of a MAU

Attributes

The <MAUList> element has no attributes.

5.84 MAU Usage Element <MAUUsage>

The <MAUUsage> element defines which MAU is used by a communication entity.

Parent Elements

Element	Description
MAUUsageList	collection of all MAUUsage elements of a communication entity

Child Elements

The <MAUUsage> element has no child elements.

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	XPath to a MAU description

5.85 MAU Usage List Element <MAUUsageList>

The <MAUUsageList> element is a collection of <MAUUsage> elements.

Parent Elements

Element	Description
communicationEntity	a communication entity
slot	description of a device slot

Child Elements

Element	Multiplicity	Description
MAUUsage	1..n	a pointer to a MAU description

Attributes

The <MAUUsageList> element has no attributes.

5.86 Maximum Value Element <maxVal>

The <maxVal> element defines the maximum value of a range.

Parent Elements

Element	Description
range	valid range of an object value

Child Elements

Any Boolean, numeric, user or time data type (see chapter 6.1).

Attributes

The <maxVal> element has no attributes.

5.87 Method Category Element <methodCategory>

The <methodCategory> element is a vendor specific category of <methodDescription> elements.

Parent Elements

Element	Description
methodDescriptionList	Collection of method descriptions

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of category
help	0..n	descriptive text
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
methodDescription	1..n	description of a method

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
enabled	enumeration	default	indicates, whether this object is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.88 Method Description Element <methodDescription>

The <method> element is used to describe a remotely called service, function, RMI, etc. It is a description of the method server from a clients perspective.

Parent Elements

Element	Description
methodCategory	vendor specific category of methods
methodDescriptionList	collection of methods of a communication entity

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of category
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	collection of graphical representations
accessPath	0..1	communication entity relative access path to method, format is system specific
argumentList	1	collection of data objects of the method
specificProperty	0..n	system specific extension
uses	0..1	XPath to element used by this method
provides	0..n	XPath to element provided by this method
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
methodDescriptionType	xsd:string	required	
enabled	enumeration	default	indicates, whether this object is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

Examples

INTERBUS Alarm Stop

Request

Code	0x1303
Parameter_Count	0x0000

Positive Confirmation

Code	0x9303
Parameter_Count	0x0001
Result	0x0000

Negative Confirmation

Code	0x9303
Parameter_Count	0x0002
Result	0XXXXX
Add_Error_Info	0XXXXX

FDCML Description

```

<methodDescription uniqueID="meth_1" methodDescriptionType="IB:FWSERVICE_Alarm_Stop">
  <label xml:lang="en-us">Alarm Stop</label>
  <argumentList>
    <argument argumentType="IN">
      <label xml:lang="en-us">Code</label>
      <datatype>
        <word xsi:nil="true" />
      </datatype>
      <const>
        <word>0x1303</word>
      </const>
    </argument>
    <argument argumentType="IN">
      <label xml:lang="en-us">Parameter Count</label>
      <datatype>
        <word xsi:nil="true" />
      </datatype>
      <const>
        <word>0x0000</word>
      </const>
    </argument>
    <argument argumentType="OUTPOSITIVE">
      <label xml:lang="en-us">Code</label>
      <datatype>
        <word xsi:nil="true" />
      </datatype>
      <const>
        <word>0x9303</word>
      </const>
    </argument>
    <argument argumentType="OUTPOSITIVE">
      <label xml:lang="en-us">Parameter Count</label>
      <datatype>
        <word xsi:nil="true" />
      </datatype>
      <const>
        <word>0x0001</word>
      </const>
    </argument>
    <argument argumentType="OUTPOSITIVE">
      <label xml:lang="en-us">Result</label>
      <datatype>
        <word xsi:nil="true" />
      </datatype>
      <const>
        <word>0x0000</word>
      </const>
    </argument>
    <argument argumentType="OUTNEGATIVE">
      <label xml:lang="en-us">Code</label>
      <datatype>
        <word xsi:nil="true" />
      </datatype>
      <const>
        <word>0x9303</word>
      </const>
    </argument>
    <argument argumentType="OUTNEGATIVE">
      <label xml:lang="en-us">Parameter Count</label>
      <datatype>
        <word xsi:nil="true" />
      </datatype>
      <const>
        <word>0x0002</word>
      </const>
    </argument>
    <argument argumentType="OUTNEGATIVE">
      <label xml:lang="en-us">Result</label>

```

```

    <datatype>
      <word xsi:nil="true" />
    </datatype>
    <enumeration>
      <label xml:lang="en-us">Error 1</label>
      <word>0x0001</word>
    </enumeration>
    ...
  </argument>
  <argument argumentType="OUTNEGATIVE">
    <label xml:lang="en-us">Add_Error_Info</label>
    <datatype>
      <word xsi:nil="true" />
    </datatype>
    <enumeration>
      <label xml:lang="en-us">some Info</label>
      <word>0x0001</word>
    </enumeration>
    ...
  </argument>
</argumentList>
</methodDescription>
</methodDescriptionList>

```

Win32 UInt32x32To64

ULONGLONG UInt32x32To64(DWORD Multiplier, DWORD Multiplicand)

```

<methodDescription uniqueID="meth_2" methodDescriptionType="WIN32:UInt32x32To64">
  <label xml:lang="en-us">UInt32x32To64</label>
  <argumentList>
    <argument argumentType="RESULT">
      <label xml:lang="en-us">Returnvalue</label>
      <datatype><unsigned64 xsi:nil="true" /></datatype>
    </argument>
    <argument argumentType="IN">
      <label xml:lang="en-us">Multiplier</label>
      <datatype><unsigned32 xsi:nil="true" /></datatype>
    </argument>
    <argument argumentType="IN">
      <label xml:lang="en-us">Multiplicand</label>
      <datatype><unsigned32 xsi:nil="true" /></datatype>
    </argument>
  </argumentList>
</methodDescription>

```

5.89 Method Description List Element <methodDescriptionList>

The <methodDescriptionList> element is a collection of methods.

Parent Elements

Element	Description
communicationEntity	a container of all network and device specific properties of the described device

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
(
methodCategory	1	vendor specific category
	OR	
methodDescription	1	description of a method
)	1..n	

Attributes

The <methodDescriptionList> element has no attributes.

5.90 Minimum Value Element <minVal>

The <minVal> element defines the minimum value of a range.

Parent Elements

Element	Description
range	valid range of an object value

Child Elements

Any Boolean, numeric, user or time data type (see chapter 6.1).

Attributes

The <minVal> element has no attributes.

5.91 Modify Entity Element <modifyEntity>

The <modifyEntity> defines how a user can modify a child element or attribute if the parent element is instantiated.

NOTE: This element is deprecated and should not be used anymore. Use the externalSchema element with a tool specific schema.

Parent Elements

Element	Description
instances	rules for instance creation of a certain element

Child Elements

Element	Multiplicity	Description
ANY	1	list of possible child elements

Attributes

Attribute	Datatype	required	Description
node	xsd:string	required	XPath to a child element

5.92 Modify Value Element <modifyValue>

The <modifyValue> element defines how a value of an attribute or element can be modified by an user if the parent element is instantiated.

NOTE: This element is deprecated and should not be used anymore. Use the externalSchema element with a tool specific schema.

Parent Elements

Element	Description
instances	rules for instance creation of a certain element

Child Elements

Element	Multiplicity	Description
(
const	1..n	a constant value
	OR	
edit	1..n	an editable string value
	OR	
enumeration	1..n	an enumerated value
	OR	
range	1..n	a range or sub range
	OR	
instanceValue	1..n	a string value
	OR	
(
yes	1	true value
	AND	
no	1	false value
)		
	OR	
yes	1	true value
	OR	
no	1	false value
	OR	
reference	1..n	pointer to another element
)	1	

Attributes

Attribute	Data Type	required	Description
node	xsd:string	required	XPath pointer to a child element or attribute

5.93 No Element <no>

The <no> element may be used in conjunction with the <yes> element. Together they represent both values of a yes/no, true/false, on/off ... combination as possible object value. Not used in conjunction with the <yes> element it represents a constant no, false, off, ... value of an object.

Parent Elements

Element	Description
additionalItem	additional item
argument	data object of method
dedicatedCfgItem	configuration item of a known item type
modifyValue	instantiation rule
specificProperty	system specific property of an element
uncommittedCfgItem	typeless configuration item

Child Objects

Element	Multiplicity	Description
(
label	1..n	name of the false value
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation
relations	0..1	container for relations

Attributes

Attribute	Datatype	required	Description
default	enumeration	default	indicates, if this value is the default value of the object, either the yes or the no element must have set this attribute to 'YES' <ul style="list-style-type: none"> • YES • NO (default)

5.94 Non Standardized Extension Element

<nonStandardizedExtension>

The <nonStandardizedExtension> element allows additional schemas to be included in a ISO 15745 conformant device profile next to the <DeviceIdentity>, <DeviceManager>, <DeviceFunction> and <ApplicationProcess> elements. Definition of content models of this <nonStandardizedExtension> element are outside the scope of this document.

Parent Elements

Element	Description
ProfileBody	description of a device

Child Elements

Any elements of the included namespace.

Attributes

The <nonStandardizedExtension> element has no attributes.

5.95 Norm Compliance Element <normCompliance>

The <normCompliance> element describes a conformance of the device to a certain norm.

Parent Elements

Element	Description
standardNormComplianceList	list of conformances

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of communication entity
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier

5.96 Offset Element <offset>

The <offset> element specifies an offset that is added to an actual value to form an scaled value:

$$x_{scale} = offset + x_{actual} * gain$$

The data type of the <gain> and <offset> elements have to be the same. They determine the data type to be used for visualization if this object.

Parent Elements

Element	Description
range	valid range of an object value

Child Elements

Any numeric or user data type element (see chapter 6.1).

Attributes

The <offset> element has no attributes.

5.97 On Element <on>

The <on> element is used to trigger events for certain values or range of values of a range. To designate ranges the character sequences ' lt ', ' le ', ' gt ' or ' ge ' have to be used. If a complete sub range shall trigger an event the character ' * ' is used.

NOTE: This element is deprecated and should not be used anymore.

Parent Elements

Element	Description
range	a valid value range of an object

Child Elements

Element	Multiplicity	Description
relations	1	relations with other elements triggered if the actual value equals the value specified in the on element

Attributes

Attribute	Datatype	required	Description
value	xsd:string	required	the value which triggers the events

5.98 Option Element <option>

The <option> element describes a device option in a textual form.

Parent Elements

Element	Description
optionsList	collection of options

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of communication entity
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
optionType	xsd:string	optional	type of option

5.99 Options List Element <optionsList>

The <optionsList> element is a collection of <option> elements.

Parent Elements

Element	Description
capabilities	descriptions of device features

Child Elements

Element	Multiplicity	Description
option	1..n	description of a device feature

Attributes

The <optionsList> element has no attributes.

5.100 Order Number Element <orderNumber>

The <orderNumber> element contains the order number of the device.

Parent Elements

Element	Description
DeviceIdentity	container of network independent device properties

Child Elements

Element	Multiplicity	Description
label	1..n	order number
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by a user <ul style="list-style-type: none"> • YES • NO (default)

5.101 Parameter Assembly Element <parameterAssembly>

The <parameterAssembly> allows the grouping of multiple <parameterDescription> Elements. The meaning of this grouping is system specific.

NOTE: Some systems may not support assemblies.

Parent Elements

Element	Description
parameterAssemblyCategory	vendor specific category of parameter assemblies
parameterAssemblyList	collection of all parameter assemblies

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
provides	1..n	XPath to <parameterDescription> elements composing this assembly
specificProperty	0..n	system specific extension
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
parameterAssemblyType	xsd:string	optional	
enabled	enumeration	default	indicates, whether this assembly is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.102 Parameter Assembly Category Element <parameterAssemblyCategory>

The <parameterAssemblyCategory> allows vendor specific structuring of <parameterAssembly> elements.

Parent Elements

Element	Description
parameterAssemblyList	collection of all parameter assemblies

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
parameterAssembly	1..n	defines a group of parameters

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
enabled	enumeration	default	indicates, whether this category is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.103Parameter Assembly List Element <parameterAssemblyList>

The <parameterAssemblyList> is a collection of <parameterAssembly> elements.

Parent Elements

Element	Description
communicationEntity	a container of all network and device specific properties of the described device

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
(
parameterAssembly	1	defines a group of parameters
	OR	
parameterAssemblyCategory	1	defines a vendor specific group of assemblies
)	1..n	

Attributes

The <parameterAssemblyList> has no attributes.

5.104 Parameter Category Element <parameterCategory>

The <parameterCategory> element allows vendor specific structuring of parameter descriptions.

Parent Elements

Element	Description
parameterDescriptionList	collection of parameterDescription elements

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of category
help	0..n	additional advice
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
parameterDescription	1..n	description of a parameter object

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
enabled	enumeration	default	indicates, if category is initially enabled YES (default) NO

5.105 Parameter Description Element <parameterDescription>

The <parameterDescription> element describes a device parameter.

Parent Elements

Element	Description
parameterCategory	vendor specific category of parameters
parameterDescription	parent description
parameterDescriptionList	container for all parameters of a communication entity

Child Elements

Element	Multiplicity	Description
(
label	0..n	name of parameter
help	0..n	additional advice
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	container for graphical representations
accessPath	1	address of the parameter
datatype	1	parameter data type
specificProperty	0..n	system specific extension
uses	0..n	XPath to element used by this parameter
provides	0..n	XPath to element provided by this parameter
parameterDescription	0..n	child parameters
instances	0..1	rules for parameter object instantiation

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
access	enumeration	required	access <ul style="list-style-type: none"> • RW - read/write • RO - read only • WO - write only
parameterDescriptionType	xsd:string	optional	additional parameter type identifier
enabled	enumeration	default	indicates, whether this parameter is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.106 Parameter Description List Element <parameterDescriptionList>

The <parameterDescriptionList> element is a collection of all parameter descriptions of a <communicationEntity>.

Parent Elements

Element	Description
communicationEntity	a communication entity

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	optional description
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
(
parameterDescription	1	description of a parameter object
	OR	
parameterCategory	1	vendor specific parameter category
)	1..n	

Attributes

The <parameterDescriptionList> element has no attributes.

5.107 Picture Element <picture>

The <picture> element stores a reference to a graphical representation of an object plus additional information like picture classification and an active point on the picture.

Parent Elements

Element	Description
pictureList	collection of picture elements

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of picture (not the file name)
help	0..n	descriptive text
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
hotspotList	0..1	collection of hotspot elements

Attributes

Attribute	Data Type	required	Description
picClassification	xsd:string	optional	classification of picture content
picType	xsd:string	required	type identifier, file extension
picName	xsd:string	required	file name
xSize	xsd:positiveInteger	optional	picture width in pixel, required for bitmaps
ySize	xsd:positiveInteger	optional	picture height in pixel, required for bitmaps

5.108 Picture List Element <pictureList>

The <pictureList> element is a collection of all graphical representations of an element.

Parent Elements

Element	Description
additionalItem	an additional Item
argument	data object of method
channel	a channel description
communicationEntity	a communication entity
dedicatedCfgItem	a configuration item of a known type
DeviceManager	a container of all network and device specific properties of the described device
localDataDescription	a description of a local data object
logicalConnectionPoint	a logical connection point
MAU	description of a network interface
methodDescription	description of a method
parameterDescription	description of a device parameter
processDataDescription	description of a process data object
processingEntity	container describing a device facility which is not a networking facility
uncommittedCfgItem	a typeless configuration item

Child Elements

Element	Multiplicity	Description
picture	1..n	reference to a graphical representation

Attributes

The <pictureList> element has no attributes.

5.109 Process Data Assembly Element <processDataAssembly>

The <processDataAssembly> allows the grouping of multiple <processDataDescription> elements. The meaning of this grouping is system specific.

NOTE: some systems may not support assemblies.

Parent Elements

Element	Description
processDataAssemblyCategory	vendor specific category of process data

ry	assemblies
processDataAssemblyList	collection of process data assemblies

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
provides	1..n	XPath to <processDataDescription> elements composing this assembly
specificProperty	0..n	system specific extension
instances	0..1	instatiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
processDataAssemblyType	xsd:string	optional	type of assembly
enabled	enumeration	default	indicates, whether this assembly is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.110 Process Data Assembly Category Element <processDataAssemblyCategory>

The <processDataAssemblyCategory> allows vendor specific structuring of <processDataAssembly> elements.

Parent Elements

Element	Description
processDataAssemblyList	container of all parameter assemblies

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text

)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
processDataAssembly	1..n	defines a group of process data objects

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
enabled	enumeration	default	indicates, whether this category is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.111 Process Data Assembly List Element <processDataAssemblyList>

The <processDataAssemblyList> is a collection of <processDataAssembly> elements.

Parent Elements

Element	Description
communicationEntity	a container of all network and device specific properties of the described device

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of collection
help	0..n	descriptive text
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
(
processDataAssembly	1	defines a group of process data objects
	OR	
processDataAssemblyCategory	1	defines a vendor specific group of assemblies
)	1..n	

Attributes

The <processDataAssemblyList> has no attributes.

5.112 Process Data Category Element <processDataCategory>

The <processDataCategory> element allows vendor specific structuring of process data objects.

Parent Elements

Element	Description
processDataDescriptionList	collection of process data objects of a communication entity

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of category
help	0..n	additional advice
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
processDataDescription	1..n	description of a process data object

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique category identifier
enabled	enumeration	default	indicates, if category is initially enabled <ul style="list-style-type: none"> • YES (default) • NO

5.113 Process Data Description Element <processDataDescription>

The <processDataDescription> elements describes an I/O data point of a communication entity.

Parent Elements

Element	Description
processDataCategory	vendor specific category
processDataDescription	parent description
processDataDescriptionList	container of all process data objects of a communication entity

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of process data description
help	0..n	additional advice/comment
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	collection of graphical representations
accessPath	1	device address of process data object
datatype	1	data type of process data object
specificProperty	0..n	for future extensions or for system specific object properties which could not be mapped to the existing elements and attributes
uses	0..1	XPath pointer to element which is uses by this process data object
provides	0..n	XPath pointer to elements which are provided by this object
processDataDescription	0..n	child objects
instances	0..1	rules for object instantiation

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique object identifier
direction	enumeration	optional	data direction <ul style="list-style-type: none"> • I - Input • Q – Output
processDataDescriptionType	xsd:string	optional	optional object type
enabled	enumeration	default	indicates, whether this object is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.114 Process Data Description List Element <processDataDescriptionList>

The <processDataDescriptionList> element is the container of all process data objects of a <communicationEntity> element.

Parent Elements

Element	Description
communicationEntity	a communication entity

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of container
help	0..n	descriptive text
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
(
processDataDescription	1	description of a process data object
	OR	
processDataCategory	1	vendor specific process data object category
)	1..n	

Attributes

The <processDataDescriptionList> element has no attributes.

5.115 Processing Entity Element <processingEntity>

The <processingEntity> element describes a facility on a device which is able to perform functionalities which are not related to network communication. These facilities are described by <communicationEntity> elements.

Parent Elements

Element	Description
DeviceManager	Container of network and device specific properties

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of processing entity
help	0..n	descriptive text
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
identity	0..1	Container for properties describing the identity of the facility
helpFileList	0..1	list of external documentation
toolList	0..1	Collection of tools specific for this facility
pictureList	0..1	Collection of graphical representations specific for this facility
cfgItemList	0..1	container of configuration items (processing characteristics)
additionalItemList	0..n	Container of extension elements; for future or vendor specific usage
logicalConnectionPointList	0..1	collection of logical connection points
logicalConnectionPointAssemblyList	0..1	collection of groups of logical connection points
internalConnectionPointList	0..1	Collection of internal connections between multiple communication entities and/or processing entities
externalSchema	0..n	entry point for element model from other namespaces

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier
processingEntityType	xsd:string	required	defines the type of the processing entity
enabled	enumeration	default	indicates if processing entity is initially enabled <ul style="list-style-type: none"> • NO : disabled • YES : enabled (default)

5.116 Product Family Element <productFamily>

The <productFamily> states a vendor specific affiliation of the device type to a certain set of devices – a family. Examples for families are design or protection class.

Parent Elements

Element	Description
DeviceIdentit	Properties describing the identity of a device or a group of

y	devices
---	---------

Child Elements

Element	Multiplicity	Description
label	1..n	product family
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.117Product ID Element <productID>

The <productID> element states a vendor specific unique ID for the device type described.

Parent Elements

Element	Description
Deviceidentity	Properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
label	1..n	system specific product ID
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.118Product Name Element <productName>

The <productName> element states a vendor specific designation or name of the device type.

Parent Elements

Element	Description
Deviceidentity	Properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
label	1..n	name of the product, type name
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.119Product Text Element <productText>

The <productText> provides the vendor the possibility to add a short textual description of the device type to a device description.

Parent Elements

Element	Description
DeviceIdentity	Properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
label	1..n	short textual description of the device
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.120Profile Body Element <ProfileBody>

The <ProfileBody> element describes a device.

Parent Elements

Element	Description
ISO15745Profile	document element
ProfilesBody	group of devices

Child Elements

Element	Multiplicity	Description
DeviceIdentity	1	container of network independent device properties suitable for identification
DeviceManager	0..1	container of network dependent communication properties and communication objects as well as information on the physical structure
DeviceFunction	1..n	network independent descriptions/definition of device functionalities from a configuration and service perspective.
ApplicationProcess	0..n	container of network independent descriptions/definition of device functionalities from the runtime perspective.
nonStandardizedExtension	0..n	entry point for element models from other namespaces

Attributes

Attribute	Data Type	required	Description
formatName	xsd:string	fixed	format identifier 'FDCML'
formatVersion	xsd:string	fixed	format version identifier '2.0'
filename	xsd:string	required	name of file with extension without path
fileCreator	xsd:string	required	creator of file
fileCreationDate	xsd:date	required	date of file creation
fileModificationDate	xsd:date	required	date of last file change
fileVersion	xsd:string	required	vendor specific version of file
supportedLanguages	xsd:NMTOKENS	optional	list of supported languages, see chapter 6.2
uniqueID	xsd:ID	optional	unique identifier, if describing a device group

5.121 Profile Class ID Element <ProfileClassID>

The <ProfileClassID> element identifies the class of the current profile.

Parent Elements

Element	Description
ProfileHeader	General profile information

Child Elements

Type of content is xsd:string. The value is ' Device '.

Attributes

The <ProfileClassID> element has no attributes.

5.122 Profile Date Element <ProfileDate>

The <ProfileDate> element states the release date of the profile.

Parent Elements

Element	Description
ProfileHeader	General profile information

Child Elements

Type of content is xsd:date.

Attributes

The <ProfileDate> element has no attributes.

5.123 Profile Header Element <ProfileHeader>

The <ProfileHeader> element contains general profile information.

Parent Elements

Element	Description
ISO15745Profile	document element

Child Elements

Element	Multiplicity	Description
ProfileIdentification	1	identification of profile
ProfileRevision	1	revision of profile
ProfileName	1	descriptive name of profile
ProfileSource	1	identification of the profile developer
ProfileClassID	1	identification of profile class
ProfileDate	0..1	release date of this revision of the profile in YYYY-MM-DD format
AdditionalInformation	0..1	location of additional information for the profile
ISO15745Reference	1	information on supported ISO 15745 part, edition and technology
IASInterfaceType	1..n	the type(s) of IAS interface(s)

Attributes

The <ProfileHeader> element has no attributes.

5.124 Profile Identification Element <ProfileIdentification>

The <ProfileIdentification> element identifies the current profile.

Parent Elements

Element	Description
ProfileHeader	General profile

r	information
---	-------------

Child Elements

Type of content is xsd:string.

Attributes

The <ProfileIdentification> element has no attributes.

5.125 Profile Name Element <ProfileName>

The <ProfileName> element contains a descriptive English name of the current profile.

Parent Elements

Element	Description
ProfileHeader	General profile information

Child Elements

Type of content is xsd:string.

Attributes

The <ProfileName> element has no attributes.

5.126 Profile Revision Element <ProfileRevision>

The <ProfileRevision> element identifies the current profile revision.

Parent Elements

Element	Description
ProfileHeader	General profile information

Child Elements

Type of content is xsd:string.

Attributes

The <ProfileRevision> element has no attributes.

5.127 ProfilesBody Element <ProfilesBody>

The <ProfilesBody> element describes a group of devices. It consists of multiple <ProfileBody> elements and a container for logical and physical connections between the devices.

Parent Elements

Element	Description
ISO15745Profile	document

element

Child Elements

Element	Multiplicity	Description
DeviceIdentity	0..1	container for identification properties
ProfileBody	1..n	description of a device
connectionList	1	container of logical and physical connections between the devices.

Attributes

Attribute	Data Type	required	Description
formatName	xsd:string	fixed	format identifier 'FDCML'
formatVersion	xsd:string	fixed	format version identifier '2.0'
fileName	xsd:string	required	name of file with extension without path
fileCreator	xsd:string	required	creator of file
fileCreationDate	xsd:date	required	date of file creation
fileModificationDate	xsd:date	required	date of last file change
fileVersion	xsd:string	required	vendor specific version of file
supportedLanguages	xsd:NMTOKENS	optional	list of supported languages, see chapter 6.2

5.128 Profile Source Element <ProfileSource>

The <ProfileSource> element identifies the developer of the current profile.

Parent Elements

Element	Description
ProfileHeader	General profile information

Child Elements

Type of content is xsd:string.

Attributes

The <ProfileSource> element has no attributes.

5.129 Profile Technology Element <ProfileTechnology>

The <ProfileTechnology> element identifies the technology within the previously specified part of ISO 15745.

Parent Elements

Element	Description
ISO15745Reference	ISO 15745 part, edition and technology

Child Elements

Type of content is xsd:string. Values may be:
 FDCML
 or a technology specific identifier (i.e. INTERBUS)

Attributes

The <ProfileTechnology> element has no attributes.

5.130 Provides Element <provides>

The <provides> element indicates:
 which communication objects (<processDataDescription>, <parameterDescription> and <methodDescription>) are provided by a certain logical connection point. Logical connection points themselves may be provided by assemblies of logical connection points;
 which objects of the <DeviceFunction> or <ApplicationProcess> are provided by communication objects;
 which communication objects are provided by an assembly of communication objects

Parent Elements

Element	Description
channel	physical or logical I/O channel
localDataDescription	a data object locally produced or consumed
logicalConnectionPoint	a logical connection point
logicalConnectionPointAssembly	group of logical connection points
methodDescription	description of a method
parameterAssembly	a group of parameters
parameterDescription	a parameter
processDataAssembly	a group of process data objects
processDataDescription	description of a process data object

Child Elements

The <provides> element has no child elements.

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	XPath compatible pointer to accumulated objects

5.131 Range Element <range>

The <range> element defines a value range or sub range of an object.

Parent Elements

Element	Description
additionalItem	an additional item
argument	data object of method
dedicatedCfgltem	a configuration item of a known type
modifyValue	instantiation information, a value has to be modified by a user
specificProperty	for future expansions
uncommittedCfgltem	a typeless configuration item

Child Elements

Element	Multiplicity	Description
minVal	0..1	minimum value, if no minVal is given the minimum value of the data type of the default value has to be assumed
maxVal	0..1	maximum value, if no maxVal is given the maximum value of the data type of the default value has to be assumed
stepVal	0..1	step value, if not given 1[.0] has to be assumed
offset	0..1	offset for scaled value
gain	0..1	factor for scaled value
default	0..1	default value of range, if not given 0[.0] has to be assumed
on	0..n	trigger for relations

NOTE: the <on> element is deprecated and should not be used.

Attributes

Attribute	Data Type	required	Description
format	xsd:string	optional	formatting instruction, see chapter 6.4
unit	xsd:string	optional	unit of value, visibleString

5.132Recalc Entity Element <recalcEntity>

The <recalcEntity> indicates which elements are to be calculated by a tool if the parent element is instantiated.

NOTE: This element is deprecated and should not be used anymore. Use the externalSchema element with a tool specific schema.

Parent Elements

Element	Description
instances	rules for instance creation of a certain element

Child Elements

The <recalcEntity> element has no child elements.

Attributes

Attribute	Data Type	required	Description
node	xsd:string	required	relative XPath to FDCML entity to be calculated, starting at the instantiated element

5.133Recalc Value Element <recalcValue>

The <recalcValue> element indicates which element or attribute values have to be recalculated by a tool if the parent element is instantiated.

NOTE: This element is deprecated and should not be used anymore. Use the externalSchema element with a tool specific schema.

Parent Elements

Element	Description
instances	rules for instance creation of a certain element

Child Elements

The <recalcValue> element has no child elements.

Attributes

Attribute	Data Type	required	Description
node	xsd:string	required	relative XPath to FDCML entity of which the value has to be calculated, starting at the instantiated element

5.134Reference Element <reference>

The <reference> element points to another object/parameter as value for the object/parameter.

Parent Elements

Element	Description
additionalItem	an additional item
argument	data object of method
dedicatedCfgItem	a configuration item of a known type
modifyValue	instantiation information, a value has to be modified by a user
specificProperty	for future expansions
uncommittedCfgItem	a typeless configuration item

Child Elements

The <reference> element has no child elements.

Attributes

Attribute	Data Type	required	Description
-----------	-----------	----------	-------------

ref	xsd:string	required	XPath pointer to another element
-----	------------	----------	----------------------------------

5.135 Relations Element <relations>

The <relations> element defines dependencies between objects. Three kinds of relations are supported.

Parent Elements

Element	Description
enumeration	enumerated element value
no	false value
on	relation trigger for value ranges
yes	true value

Child Elements

Element	Multiplicity	Description
(
enable	1	the actual object value triggers the enabling of another object
	OR	
disable	1	the actual object value triggers the disabling of another object
	OR	
change	1	the actual object value triggers a change of value of another object
)	1..n	

Attributes

The <relations> element has no attributes.

5.136 Serial Number <serialNumber>

The <serialNumber> provides the serial number of the described parent facility.

NOTE: this is not a device type information.

Parent Elements

Element	Description
DeviceIdentity	properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
label	1..n	name of device instance
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.137Slot Element <slot>

The <slot> element defines a list of devices that can be attached to the slot defined here.

Parent Elements

Element	Description
slotList	container for all slot definitions

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of container
help	0..n	descriptive text
)	1	
	OR	
(
labelRef	1	pointer to text resource
help	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
MAUUsageList	1	MAU(s) used by this slot
defaultfile	0..1	filename of device description of default device
file	1..n	filename of device description of attachable device
specificProperty	0..n	for extensions outside the scope of this specification
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	required	unique identifier
number	xsd:string	required	slot number
enabled	enumeration	default	indicates, whether this element is initially enabled or not YES (default) NO

The `number` attribute can contain a single number ('3'), a list of numbers ('3,5,7'), a number range ('1-3') or a combination ('1-2,4,6,9-10'). If the child devices (modules)

may be attached to any slot, use a number, defining the maximum number of attachable child devices (modules). If for example 64 child devices (modules) may be attached to a parent device use `slot number='1-64'`.

If it is necessary to indicate that a certain slot is to be left empty, add a file element with an empty href attribute or create an empty FDCML shell (DeviceIdentity only).

The order of the MAU usages has to reflect the order of slot numbers in the `number` attribute.

5.138 Slot List Element <slotList>

The <slotList> element is a container for <slot> definitions.

Parent Elements

Element	Description
deviceStructure	physical device structure

Child Elements

Element	Multiplicity	Description
slot	1..n	slot definition

Attributes

The <slotList> element has no attributes.

5.139 Slot Usage Element <slotUsage>

The <slotUsage> element defines, which slots can be used by a communication entity.

Parent Elements

Element	Description
slotUsageList	collection of slotUsage elements

Child Elements

The <slotUsage> element has no child elements.

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	XPath to a slot element

5.140 Slot Usage List Element <slotUsageList>

The <slotUsageList> element is a collection of <slotUsage> elements.

Parent Elements

Element	Description
communicationEntity	a communication

y	entity
---	--------

Child Elements

Element	Multiplicity	Description
slotUsage	1..n	a definition which slot is used by the communication entity

Attributes

The <slotUsageList> element has no attributes.

5.141 Specification Revision Element <specificationRevision>

The <specificationRevision> states the version or revision of the specification to which the device or parent facility conforms.

Parent Elements

Element	Description
DeviceIdentity	Properties describing the identity of a device or a group of devices
identity	Properties describing the identity of a facility in a device

Child Elements

Element	Multiplicity	Description
label	1..n	revision of specification
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by a user <ul style="list-style-type: none"> YES NO (default)

5.142 Specific Property Element <specificProperty>

The <specificProperty> element is used to add additional information without the need to have to change the format of FDCML.

Parent Elements

Element	Description
additionalItem	an additional item
argument	data object of method
channel	a logical or physical channel
connection	description of a physical or logical connection between deviceProfile elements in a devicesProfile element
dedicatedCfgItem	a configuration item of a known type

internalConnectionPoint	a connection between two communication entities or processing entities
LED	a LED on the device
LEDState	a possible state of a LED
localDataDescription	a data object locally produced or consumed
logicalConnectionPoint	a logical connection point
logicalConnectionPointAssembly	group of logical connection points
MAU	a network interface
methodDescription	description of a method
parameterAssembly	a group of parameters
parameterDescription	a description of a device parameter
processDataAssembly	a group of process data objects
processDataDescription	a description of a process data object
slot	description of a device slot

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of property
help	0..n	additional advice/comment
)	0..1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	0..1	
helpFileRef	0..1	pointer to external documentation
(
const	1..n	a constant property value
	OR	
edit	1..n	an editable string value
	OR	
enumeration	1..n	an enumerated property value
	OR	
range	1..n	a range or sub range
	OR	
instanceValue	1..n	instance value
	OR	
(
yes	1	true value
	AND	
no	1	false value
)		
	OR	
yes	1	true value
	OR	
no	1	false value
	OR	
reference	1..n	reference to another element
)		

Attributes

Attribute	Datatype	required	Description
propertyType	xsd:string	required	type identifier of property
enabled	enumeration	default	indicates, whether this element is initially enabled or not YES (default) NO

5.143 Standard Compliance Element <standardCompliance>

The <standardCompliance> element describes a conformance of the device to a certain standard.

Parent Elements

Element	Description
standardNormComplianceList	list of conformances

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of communication entity
help	0..n	descriptive text
)		
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)		
helpFileRef	0..1	pointer to external documentation

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier

5.144 Standard and Norm Compliance List Element <standardNormComplianceList>

The <standardNormComplianceList> describes conformances of the device to standards and norms.

Parent Elements

Element	Description
capabilities	descriptions of device features

Child Elements

Element	Multiplicity	Description
standardCompliance	1..n	device conforms to a certain standard
normCompliance	1..n	device conforms to a certain norm

Attributes

The <standardNormComplianceList> element has no attributes.

5.145 Step Value Element <stepVal>

The <stepVal> element defines the step width of a range value.

Parent Elements

Element	Description
range	valid range of an object value

Child Elements

Any Boolean, numeric, user or time data type (see chapter 6.1).

Attributes

The <stepVal> element has no attributes.

5.146 Structured Type Element <structuredType>

The <structuredType> element is used to define a device specific structured data type or record.

Parent Elements

Element	Description
datatypeTemplate	definition of a device specific data type

Child Elements

Element	Multiplicity	Description
(
help	0..n	additional advice/comment
	OR	
helpRef	0..1	pointer to text resource
)		
(
varDeclaration	1	element declaration (simple type)
	OR	
subrangeVarDeclaration	1	element declaration (range type)
)	1..n	

Attributes

The <structuredType> element has no attributes.

5.147 Subrange Element <subrange>

The <subrange> is used to describe range or array bounds.

Parent Elements

Element	Description
arrayType	array declaration
subrangeType	(sub-)range declaration
subrangeVarDeclaration	(sub-)range declaration within a structured type
varDeclaration	declaration of an element of e structured

	type
--	------

Child Elements

The <subrange> element has no child elements.

Attributes

Attribute	Datatype	required	Description
lowerLimit	xsd:string	required	lower range limit or array bound (inclusive)
upperLimit	xsd:string	required	upper range limit or array bound (inclusive)

5.148Subrange Type Element <subrangeType>

The <subrangeType> element is used to declare a device specific datatype restricted to upper and lower bounds.

Parent Elements

Element	Description
datatypeTemplate	declaration of a device specific data type

Child Elements

Element	Multiplicity	Description
(
help	0..n	additional advice/comment
	OR	
helpRef	0..1	pointer to text resource
)		
*	1	any integer data type element (see chapter 6.1)
subrange	1	bounds of this data type

Attributes

Attribute	Datatype	required	Description
initialValue	xsd:string	optional	initial value of data type

5.149Subrange Variable Declaration <subrangeVarDeclaration>

The <subrangeVarDeclaration> is used to declare a range element in a structured device specific datatype.

Parent Elements

Element	Description
structuredType	declaration of a structured device specific data type (record)

Child Elements

Element	Multiplicity	Description
(
label	1..n	name
help	0..n	additional advice
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
*	1	any integer data type element (see chapter 6.1)
subrange	1	bounds of this data type

Attributes

Attribute	Datatype	required	Description
initialValue	xsd:string	optional	initial value of data type

5.150 Tool Element <tool>

The <tool> element specifies an object specific tool.

Parent Elements

Element	Description
toolList	container for tool definitions

Child Elements

The <tool> element has no child elements.

Attributes

Attribute	Data Type	required	Description
toolClassification	xsd:string	required	classifies the task of the tool
toolID	xsd:string	required	operating system specific unique identification of the tool (PROGID or GUID for Windows systems)

The format of the toolClassification attribute is:

```
"tool" ":" System [ "/" Subsystem] "/" SystemType [ "/" HostTool [
"/" HostComponent]]
```

where

System operating system family (e.g. Win32)

Subsystem operating system (e.g. Win2000)

SystemType type of tool (e.g. ActiveX)

HostTool framework application for tool
 HostComponent framework application component

The format of the toolID attribute is:

for ProgID: "ProgID" ":" ProgID

for GUID: "GUID" ":" GUID

5.151 Tool List Element <toolList>

The <toolList> element is a container for parent element specific tools.

Parent Elements

Element	Description
communicationEntity	a communication entity
DeviceManager	a container of all network and device specific properties of the described device
processingEntity	container describing a device facility which is not a networking facility

Child Elements

Element	Multiplicity	Description
tool	1..n	a tool definition

Attributes

The <toolList> element has no attributes.

5.152 Type Name Element <typeName>

The <typeName> element contains the name of the type of the parent facility.

Parent Elements

Element	Description
identity	Properties describing the identity of a facility in a device

Child Elements

Element	Multiplicity	Description
label	1..n	name of type
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> YES

			• NO (default)
--	--	--	----------------

5.153 Uncommitted Configuration Item Element <uncommittedCfgItem>

The <uncommittedCfgItem> is an element used to model device specific behavior which influences <dedicatedCfgItem> elements.

Parent Elements

Element	Description
cfgItemList	container for configuration items
itemCategory	vendor specific category of configuration items
uncommittedCfgItem	a parent configuration item

Child Elements

Element	Multiplicity	Description
(
label	1..n	name of item
help	0..n	additional advice/comment
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
pictureList	0..1	container for graphical representations
(
const	1..n	a constant item value
	OR	
edit	1..n	an editable string value
	OR	
enumeration	1..n	an enumerated item value
	OR	
range	1..n	a value range of a set of subranges
	OR	
(
yes	1	true value
	AND	
no	1	false value
)		
	OR	
yes	1	true item value
	OR	
no	1	false item value
	OR	
reference	1..n	reference to another item
	OR	
instanceValue	1	instance value
)		
uncommittedCfgle m	0..n	child item
instances	0..1	instantiation information

Attributes

Attribute	Data Type	required	Decription
uniqueID	xsd:ID	required	unique identifier
enabled	enumeration	default	indicates, whether this item is initially enabled or not <ul style="list-style-type: none"> • YES (default) • NO

5.154Uses Element <uses>

The <uses> element defined a 'uses' association between two FDCML elements.

Parent Elements

Element	Description
channel	logical or physical I/O channel
internalConnectionPoint	a connection between two communication entities
localDataDescription	a locally consumed or produced data object
logicalConnectionPoint	a logical connection point
logicalConnectionPointAssembly	an assembly of logical connection points
methodDescription	description of a method
parameterDescription	description of a parameter
processDataDescription	description of a process data object
varDeclaration	declaration of a device specific data type

Child Elements

The <uses> element has no child elements.

Attributes

Attribute	Data Type	required	Description
ref	xsd:string	required	XPath to used element

5.155 Value Element <value>

The <value> element contains the value of a device characteristic.

Parent Elements

Element	Description
characteristic	device characteristic

Child Elements

Element	Multiplicity	Description
---------	--------------	-------------

const	1..n	constant item value
	OR	
edit	1..n	editable string value
	OR	
enumeration	1..n	enumerated item value
	OR	
range	1..n	(sub)range of item value
	OR	
(
yes	1	true item value
	AND	
no	1	false item value
)		
	OR	
yes	1	true item value
	OR	
no	1	false item value
	OR	
reference	1..n	pointer to another item
	OR	
instanceValue	1	object value of device instance, NOTE: this is not a device type information

Attributes

Attribute	Data Type	required	Description
uniqueID	xsd:ID	optional	unique identifier

5.156 Variable Declaration Element <varDeclaration>

The <varDeclaration> element is used to declare an element of a device specific data type

Parent Elements

Element	Description
structuredType	declaration of a structured device specific data type (record)

Child Elements

Element	Multiplicity	Description
(
label	1..n	name
help	0..n	additional advice
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
(

*	1	any data type element (see chapter 6.1)
	OR	
uses	1	XPath to existing data type declaration
)		
subrange	0..n	array bounds

Attributes

Attribute	Datatype	required	Description
initialValue	xsd:string	optional	initial value of data type

5.157 Vendor ID Element <vendorID>

The <vendorID> is the IEEE OUI (Organizationally Unique Identifier, see <http://standards.ieee.org/regauth/oui/index.shtml>) of the vendor.

Parent Elements

Element	Description
DeviceIdentity	Properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
label	1..n	vendor OUI
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.158 Vendor Name Element <vendorName>

The <vendorName> provides the name of the vendor of the described parent facility.

Parent Elements

Element	Description
DeviceIdentity	Properties describing the identity of a device or a group of devices
identity	Properties describing the identity of a facility in a device

Child Elements

Element	Multiplicity	Description
label	1..n	vendor name
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.159 Vendor Text Element <vendorText>

The <vendorText> allows the vendor the possibility to provide additional information on the company like address or hotline number.

Parent Elements

Element	Description
DeviceIdentity	Properties describing the identity of a device or a group of devices

Child Elements

Element	Multiplicity	Description
label	1..n	additional vendor information
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Datatype	required	Description
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.160 Version Element <version>

The <version> element is able to store different types of version information like hardware or firmware version.

Parent Elements

Element	Description
DeviceIdentity	Properties describing the identity of a device or a group of devices
identity	Properties describing the identity of a facility in a device

Child Elements

Element	Multiplicity	Description
label	1..n	version information
	OR	
labelRef	1	pointer to external text resource

Attributes

Attribute	Data Type	required	Description
versionType	xsd:string	required	type of version i.e. Hardware, Firmware
readOnly	enumeration	default	indicates if the value may be edited by an user <ul style="list-style-type: none"> • YES • NO (default)

5.161Yes Element <yes>

The <yes> element may be used in conjunction with the <no> element. Together they represent both values of a yes/no, true/false, on/off ... combination as possible object values. Not used in conjunction with the <no> element it represents a constant no, false, off, ... value of an object.

Parent Elements

Element	Description
additionalItem	additional item
argument	data object of method
dedicatedCfgItem	configuration item of a known item type
modifyValue	instantiation rule
specificProperty	for further expansion
uncommittedCfgItem	typeless configuration item

Child Objects

Element	Multiplicity	Description
(
label	1..n	name of the false value
help	0..n	optional description
)	1	
	OR	
(
labelRef	1	pointer to text resource
helpRef	0..1	pointer to text resource
)	1	
helpFileRef	0..1	pointer to external documentation
relations	0..1	container for relations

Attributes

Attribute	Data Type	required	Description
default	enumeration	default	indicates, if this value is the default value of the object, either the yes or the no element must have set this attribute to 'YES' <ul style="list-style-type: none">• YES• NO (default)

6. Additional Information

6.1 Datatype Elements

FDCML data type elements are based on IEC 61158 and IEC 61131 data type definitions plus extensions like IP addresses.

NOTE: If the content in an instance is empty, a `xsi:nil='true'` has to be added.

Element Name	Group	IEC61158 Name	Content
array	complex	n/a ¹	xsd:string ²
binaryDate	date	BinaryDate	xsd:string
binaryDate2000	date	BinaryDate2000	xsd:string
binaryTime0	time	BinaryTime0	xsd:unsignedShort
binaryTime1	time	BinaryTime1	xsd:unsignedShort
binaryTime2	time	BinaryTime2	xsd:unsignedShort
binaryTime3	time	BinaryTime3	xsd:unsignedShort
binaryTime4	time	BinaryTime4	xsd:unsignedInt
binaryTime5	time	BinaryTime5	xsd:unsignedInt
binaryTime6	time	BinaryTime6	xsd:unsignedInt
binaryTime7	time	BinaryTime7	xsd:unsignedLong ³
binaryTime8	time	BinaryTime8	xsd:string
binaryTime9	time	BinaryTime9	xsd:string
bitstring	string	BitString	xsd:string ⁴
bool	boolean	n/a ⁵	xsd:boolean
boolean	boolean	Boolean	xsd:boolean
byte	boolean	BitString8 BYTE	xsd:string ⁶
compactBooleanArray	boolean	CompactBooleanArray	xsd:string ⁷
date	date	Date without time indication DATE	xsd:date ⁸
date7	date	Date with time indication	xsd:dateTime ⁹
date_and_time	date and time	DATE_AND_TIME	xsd:string

¹ Used to describe arrays or lists, items are separated with comma, multi-dimensional arrays are modeled as array elements within parent array elements.

² Attributes:

- dim (required): array dimension, type = xsd:nonNegativeInteger
- maxDim (optional): maximum dimension, type = xsd:nonNegativeInteger
- embeddedDatatype (required): type of array items, type = enumeration (one of the defined data types)
- embeddedStringLength (optional): length of string items, type = xsd:nonNegativeInteger

³ maxInclusive=281474976710655

⁴ pattern = (([0-1]{8})_?)*([0-1]{8})

Attribute:

- length (required): length in octets, type = xsd:nonNegativeInteger

⁵ Data type with length = 1 bit

⁶ pattern = 0x([0-9][A-F]){2}

⁷ pattern = 0x([0-9][A-F]){2}

⁸ lexical representation = ['-']CCYY'-MM'-DD

⁹ lexical representation = ['-']CCYY'-MM'-DD'T'hh':'mm':'ss['.'](s(n))

Element Name	Group	IEC61158 Name	Content
dint	numeric/ integer/ signedInteger	Integer32 DINT	xsd:int
dword	boolean	BitString32 DWORD	xsd:string ¹⁰
fieldbusTime	date and time	FieldbusTime	xsd:string
fTime	time	FTIME	xsd:int
int	numeric/ integer/ signedInteger	Integer16 INT	xsd:short
IPV4Address	user	n/a ¹¹	xsd:string ¹²
IPV6Address	user	n/a ¹³	xsd:string ¹⁴
iTime	time	ITIME	xsd:short
lint	numeric/ integer/ signedInteger	Integer64 LINT	xsd:long
lreal	numeric/ float	Float64 LREAL	xsd:double
lTime	time	LTIME	xsd:long
lword	boolean	BitString64 LWORD	xsd:string ¹⁵
octetString	string	OctetString	xsd:string ¹⁶
octetString1	boolean	OctetString1	xsd:string ¹⁷
octetString16	boolean	OctetString16	xsd:string ¹⁸
octetString2	boolean	OctetString2	xsd:string ¹⁹
octetString4	boolean	OctetString4	xsd:string ²⁰
octetString8	boolean	OctetString8	xsd:string ²¹
real	numeric/ float	Float32 Floating Point REAL	xsd:float
record	complex	n/a ²²	EMPTY ²³
sint	numeric/ integer/ signedInteger	Integer8 SINT	xsd:byte
time	time	TIME	xsd:int
time_of_day	time	TimeOfDay without date indication TIME_OF_DAY	xsd:unsignedInt

¹⁰ pattern = 0x{[0-9][A-F]}{8}

¹¹ IP V4 Address in dotted notation

¹² pattern = ((([1-9]?[0-9]|1[0-9]|2[0-4][0-9]|25[0-5])\.){3}([1-9]?[0-9]|1[0-9]|2[0-4][0-9]|25[0-5]))

¹³ IP V6 Address in dotted notation

¹⁴ pattern = ((([1-9]?[0-9]|1[0-9]|2[0-4][0-9]|25[0-5])\.){5}([1-9]?[0-9]|1[0-9]|2[0-4][0-9]|25[0-5]))

¹⁵ pattern = 0x{[0-9][A-F]}{16}

¹⁶ pattern = (0x{[0-9][A-F]}{2},)*0x{[0-9][A-F]}{2}

Attribute:

- length (required): length in octets, type = xsd:nonNegativeInteger

¹⁷ pattern = 0x{[0-9][A-F]}{2}

¹⁸ pattern = 0x{[0-9][A-F]}{32}

¹⁹ pattern = 0x{[0-9][A-F]}{4}

²⁰ pattern = 0x{[0-9][A-F]}{8}

²¹ pattern = 0x{[0-9][A-F]}{16}

²² Used to describe a structured data type, items are modeled as child elements of the same XDDML element as ist parent.

²³ Attributes:

- elements (required): number of items, type = xsd:nonNegativeInteger
- maxElements (optional): number of possible items, type = xsd:nonNegativeInteger
- octetLength (optional): length in octets, type = xsd:nonNegativeInteger
- format (optional): see chapter 6.4

Element Name	Group	IEC61158 Name	Content
timeDifference4	time	TimeDifference without date indication	xsd:unsignedInt
timeDifference6	date and time	TimeDifference with date indication	xsd:string
timeOfDay6	date and time	TimeOfDay with date indication	xsd:string
timeValue	time	TimeValue	xsd:unsignedLong
udint	numeric/ integer/ unsignedInteger	Unsigned32 UDINT	xsd:unsignedInt
udt	user	n/a ²⁴	xsd:string ²⁵
uint	numeric/ integer/ unsignedInteger	Unsigned16 UINT	xsd:unsignedShort
ulint	numeric/ integer/ unsignedInteger	Unsigned64 ULINT	xsd:unsignedLong
universalTime	date and time	UniversalTime	xsd:string ²⁶
usint	numeric/ integer/ unsignedInteger	Unsigned8 USINT	xsd:unsignedByte
visibleString	string	VisibleString[n] UNICODE Char VisibleString UNICODE String STRING STRING2 STRINGN SHORT_STRING	xsd:string ²⁷
word	boolean	BitString16 WORD	xsd:string ²⁸

6.2 Language Identifier

for the `xml:lang` attribute:

The language identifier consists of a combination of language code (as defined in ISO 639) plus optional minus-sign plus optional country code (as defined in ISO 3166-1).

Examples

²⁴ Used to describe simple user defined data types (i.e. INT48).

²⁵ Attributes:

- name (required): name of data type, type = xsd:string
- bitLength (required): length in bit, type = xsd_nonNegativeInteger
- interpretation (required): defines how it is to be evaluated, type = enum (BIT|UNSIGNED|INTEGER)

²⁶ pattern = `[0-9]{2}((0[1-9])1[0-2])((0[1-9])(1-2)[0-9])|(3(0-1))((0-1)[0-9])|(2[0-3])((0-5)[0-9])}{2}`

²⁷ Attributes:

- `xml:lang` (optional): language identifier, see chapter 6.2, type = xsd:language
- `maxLen` (optional): maximum permissible length in octets, type = xsd_nonNegativeInteger
- `charSet` (optional): character set, if missing assume UTF-8, type = xsd:string

²⁸ pattern = `0x([0-9][A-F]){4}`

Language	value of xml:lang
English (United States)	en-us
German (Standard)	de
French (Standard)	fr
Spanish (Standard)	es
Italian (Standard)	it
Portuguese (Brazil)	pt-br

for the `supportedLanguages` attribute:

The identifier of supported languages consists of a list of language codes plus optional country codes.

Example

```
supportedLanguages="en-us de fr es"
```

6.3 Text Resource File Format

The usage of resource files allows to reuse text definitions in multiple FDCML files. Text resources are referenced in an FDCML file with the `<dictionary>` element. A text entry defined in the resource file is referenced with the `<labelRef>` and `<helpRef>` elements. One resource file contains texts of one language. It is at the tool vendors discretion to include this text resources during runtime or with a preprocessor.

The resource file Schema consists of two elements.

FDCML Text Resource Element `<FDCMLTextResource>`

The `<FDCMLTextResource>` element is the document element of a text resource file.

Parent Elements

Element	Description
document root	

Child Elements

Element	Multiplicity	Description
textEntry	1..n	definition of a single text

Attributes

Attribute	Datatype	required	Description
xml:lang	xsd:language	required	language of texts in this file, see chapter 6.2

Text Entry Element `<textEntry>`

The `<textEntry>` element stores a single text.

Parent Elements

Element	Description
FDCMLTextResource	document element

Child Elements

Type of content is xsd:string.

Attributes

Attribute	Datatype	required	Description
textID	xsd:ID	required	unique identifier of text entry

Example

Please note, that text resources in different languages always have the same dictID.

FDCML instance:

```

...
<dictionaryList>
  <dictionary xml:lang='en-us' dictID='dict'>
    <file xlink:href='Texten.xml' />
  </dictionary>
  <dictionary xml:lang='de' dictID='dict'>
    <file xlink:href='Textde.xml' />
  </dictionary>
</dictionaryList>
...
<labelRef textID='text_1' dictID='dict' />
...
English Text Resource File:
<FDCMLTextResource xml:lang='en-us'>
  <textEntry textID='text_1'>This is the English
label</textEntry>
  ...
</FDCMLTextResource>
German Text Resource File:
<FDCMLTextResource xml:lang='de'>
  <textEntry textID='text_1'>Das ist der Deutsche
Bezeichner</textEntry>
  ...
</FDCMLTextResource>

```

6.4 Format Specification

The format of the `format` attribute equals the printf format specification field of ANSI C:

```
% [flags] [width] [.precision] [{h | l | 164 | L}] type
```