
**Industrial automation systems and
integration — Service interface for testing
applications —**

**Part 4:
Device capability profile template**

iTeh STANDARD PREVIEW
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*Systemes d'automatisation industrielle et integration — Interface de
service pour contrôler les applications —
Partie 4: Modèle de profil de capacité de dispositif*

ISO 20242-4:2011

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 20242-4 was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 5, *Interoperability, integration, and architectures for enterprise systems and automation applications*.

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ISO 20242 consists of the following parts under the general title *Industrial automation systems and integration — Service interface for testing applications*:

- *Part 1: Overview* <https://standards.iteh.ai/catalog/standards/sist/feb6fdb-a81f-442d-8faf-888e75efc8aa/iso-20242-4-2011>
- *Part 2: Resource management service interface*
- *Part 3: Virtual device service interface*
- *Part 4: Device capability profile template*

The following parts are under preparation:

- *Part 5: Application program service interface*
- *Part 6: Conformance test methods, criteria and reports*

Introduction

The motivation for ISO 20242 stems from the desire of international automotive industries and their suppliers to facilitate the integration of automation and measurement devices, and other peripheral components for this purpose, into computer-based applications. ISO 20242 defines rules for the construction of device drivers and their behaviour in the context of an automation and/or measurement application.

The main goal of ISO 20242 is to provide users with:

- independence from the computer operating system;
- independence from the device connection technology (device interface/network);
- independence from device suppliers;
- the ability to ensure compatibility between device drivers and connected devices, and their behaviour in the context of a given computer platform;
- independence from the technological device development in the future.

ISO 20242 does not necessitate the development of new device families or the use of special interface technologies (networks). It encapsulates a device and its communication interface to make it compatible with other devices of that kind for a given application.

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Industrial automation systems and integration — Service interface for testing applications —

Part 4: Device capability profile template

1 Scope

This part of ISO 20242 defines the formatting, syntax and semantic rules for describing

- device and coordinator capabilities with XML schema, and
- the configuration of devices with XML.

NOTE This part of ISO 20242 does not address the coordinator configuration, which will be addressed elsewhere in the ISO 20242 series.

2 Normative references

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

ISO 15745-1, *Industrial automation systems and integration — Open systems application integration framework — Part 1: Generic reference description*

ISO 20242-1, *Industrial automation systems and integration — Service interface for testing applications — Part 1: Overview*

ISO 20242-3, *Industrial automation systems and integration — Service interface for testing applications — Part 3: Virtual device service interface*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20242-1, ISO 20242-3 and the following apply.

3.1

communication object

existing object which may be accessed with a communication function to read or write a value

[ISO 20242-1:2005, definition 2.3]

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3.2

coordinator

program with a specified interface to handle the access of an application program to one or more device drivers and to manage real-time application aspects, synchronization and events

[ISO 20242-1:2005, definition 2.4]

3.3

coordinator capability description

text file containing information about the capabilities of coordinators in a defined format (i.e. structure, syntax)

3.4

device capability description

text file containing information about the capabilities of virtual devices in a defined format (i.e. structure, syntax)

[ISO 20242-1:2005, definition 2.5]

3.5

device driver

software module providing an ISO 20242-specified interface with service functions to call a platform adapter to access physical devices

[ISO 20242-2:2010, definition 3.1]

3.6

function object

instance describing one capability of a virtual device

[ISO 20242-3:2011, definition 3.4]

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<https://standards.iteh.ai/catalog/standards/sist/feb6fdb-a81f-442d-8faf-888e75efc8aa/iso-20242-4-2011>

3.7

operation

instance describing one complete procedure

[ISO 20242-3:2011, definition 3.5]

3.8

parameterization instance description

information about the configuration of a coordinator and of virtual devices

3.9

virtual device

representation of one or more physical devices and/or stand-alone software modules that provide an unambiguous view of the resources of a communication interface

[ISO 20242-3:2011, definition 3.7]

4 Abbreviated terms

CCD	Coordinator Capability Description
DCD	Device Capability Description
DCPT	Device Capability Profile Template
PID	Parameterization Instance Description

VD	Virtual Device
VDSI	Virtual Device Service Interface
XML	eXtensible Markup Language

5 Device capability profile framework

5.1 General

For the design of device capability profile templates (DCPTs), device capability descriptions (DCDs) and coordinator capability descriptions (CCDs), a device capability profile framework as shown in Figure 1 shall be used. The generic DCPT shall use the generic information exchange profile template of ISO 15745-1 as a skeleton and shall be constructed in XML schema. The technology-specific DCPT describes technology-specific capabilities and shall extend the generic DCPT in XML schema. A DCD describes capabilities of virtual devices in a device driver and shall extend a technology-specific DCPT in XML schema. A CCD describes capabilities of a coordinator and shall extend a technology-specific DCPT in XML schema. A CCD imports DCDs for device drivers and describes capabilities of a system. A parameterization instance description (PID) describes configurations of a coordinator and device drivers. A PID shall be constructed by instantiations of one CCD and one to many DCDs. The PID is a realization of the information exchange profile in ISO 15745-1 and can be used together with other profiles of ISO 15745.

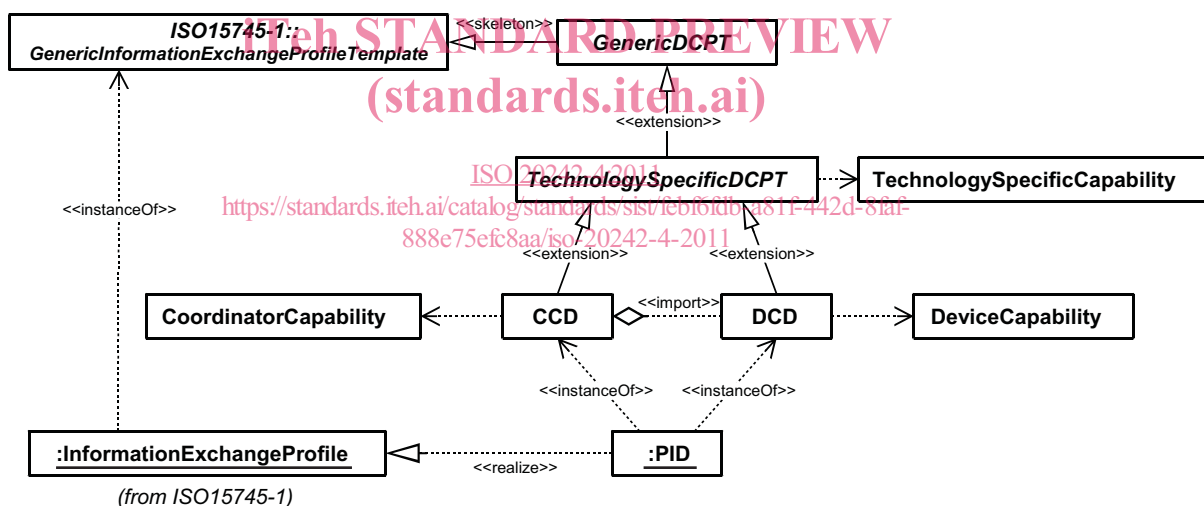


Figure 1 — Class diagram of device capability profile framework

Figure 2 shows the class diagram of CCD and DCD in the framework. The generic DCPT specifies the aggregate of the generic CCD and generic DCD. The generic CCD describes generic capabilities of a coordinator. The generic DCD describes generic capabilities of virtual devices. The technology-specific CCD in a technology-specific DCPT shall inherit the generic CCD and describes technology-specific capabilities of a coordinator. The technology-specific DCD shall inherit the generic DCD and describes technology-specific capabilities of virtual devices.

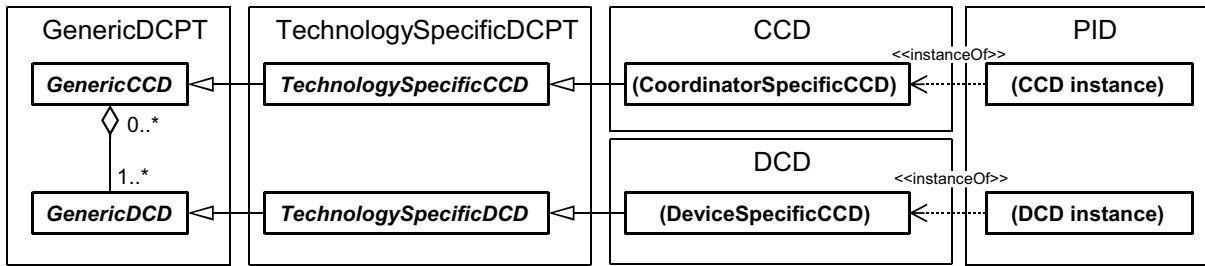


Figure 2 — Class diagram of CCD and DCD

The coordinator-specific CCD shall inherit the technology-specific CCD and describes coordinator-specific capabilities. The name of a coordinator-specific CCD can be described by the coordinator-specific name. The device-specific DCD shall inherit the technology-specific DCD and shows device-specific capabilities. The name of a device-specific DCD can be described by the device-driver-specific name. Between the generic CCD and the generic DCD, there shall be an aggregation relation as shown in Figure 2. A generic CCD may contain one to many generic DCDs. Different generic CCDs may use the same generic DCD. Generic DCDs may exist without a generic CCD. The coordinator-specific CCD and the device-specific DCD have the aggregation relation from inheritance. A CCD can import the DCDs of device drivers. The CCD instance in a PID shall be an XML instance of the coordinator-specific CCD XML schema. A DCD instance in a PID shall be an XML instance of a device-specific DCD XML schema. The XML tag name of a CCD instance shall be the name of the coordinator-specific CCD. The XML tag name of a DCD instance shall be the name of the device-specific DCD.

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5.2 Creation procedure of DCD, CCD and PID

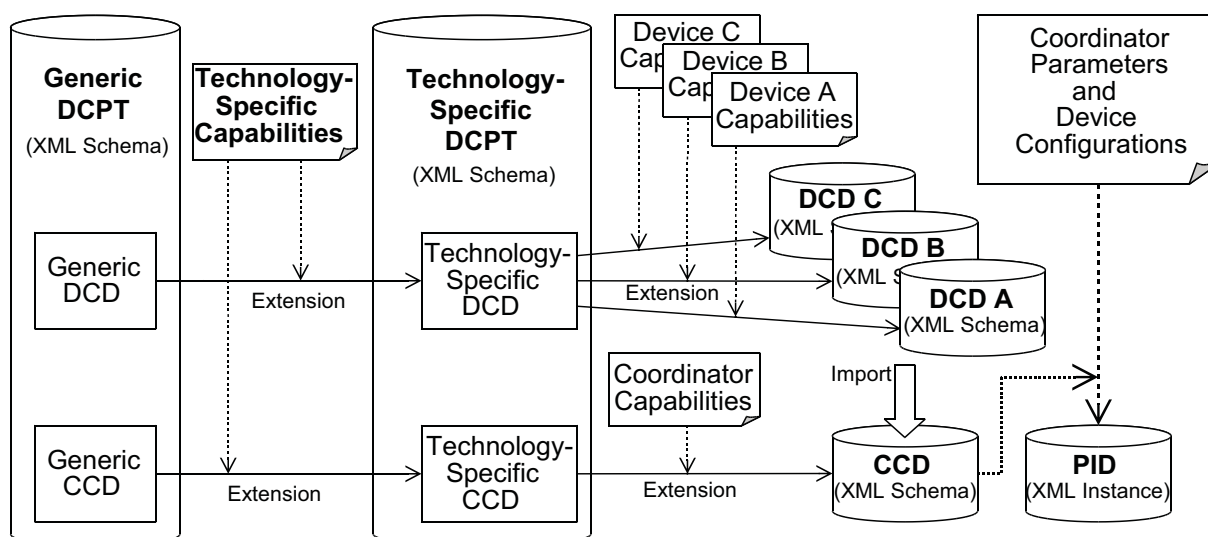
5.2.1 General

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Figure 3 shows the creation procedure of DCD and CCD. Clause 6 defines the generic DCPT in XML schema. The technology of each service interface defines technology-specific capabilities as a technology-specific DCPT.

NOTE Technology-specific DCPTs for ASAM GDI, MICX and ORiN are described in Annexes A, B and C.

The vendor of a device, equipment or software module shall extend the technology-specific DCD of the technology-specific DCPT with the capabilities of the device or equipment. The resulting DCD XML schema shall be provided together with a device driver. The vendor of a coordinator shall extend the technology-specific CCD of the technology-specific DCPT with the capabilities of the coordinator. The resulting CCD XML schema shall be provided with the coordinator. A configuration tool can import the CCD and the required DCDs to create the PID XML instance with the configuration data for the required application. The PID shall contain all required instances with names and values. The coordinator can read the PID XML instance and perform a coordinator setup and the configuration of devices, equipment or software modules. The configuration shall be performed via the virtual device service interface (VDSI) of the device drivers as defined in ISO 20242-3.



NOTE In this figure, a cylinder shape shows the XML file and a paper shape shows the capability or configuration information. A solid arrow shows the extension of the XML schema file. A broken arrow shows the injection of capability or configuration information. A small dotted arrow shows the application of the XML schema.

Figure 3 — Creation procedure of CCD and DCD

5.2.2 Device capability description (DCD)

The DCD shall be an XML schema and shall contain the following:

- identification information of the device driver;
- a description of device capabilities of virtual devices supported by the device driver.

5.2.3 Coordinator capability description (CCD)

The CCD shall be an XML schema and shall contain the following:

- identification information of the coordinator software;
- a description of coordinator capabilities;
- qualification of the supported application program service interface.

5.2.4 Parameterization instance description (PID)

The PID shall be an XML instance and shall contain the following:

- identification information of the PID as information exchange profile of ISO 15745;
- a description of parameterization instances with application-defined names;
- configuration data for the device drivers.

6 Generic device capability profile template

6.1 General

The generic DCPT defines the common structure of DCPT and is not dependent on technology of a service interface. A technology-specific DCPT extends the generic DCPT.

6.2 Generic DCPT model

The generic DCPT extends the information of the VDSI model in ISO 20242-3. Figure 4 shows the class structure of the generic DCPT. The information exchange profile is the root class and contains the ISO 15745 header and the ISO 15745 body. The ISO 15745 header describes the identification information of a profile. The ISO 15745 body contains one or more generic CCDs. The information exchange profile, the ISO 15745 header and the ISO 15745 body are defined in ISO 15745-1.

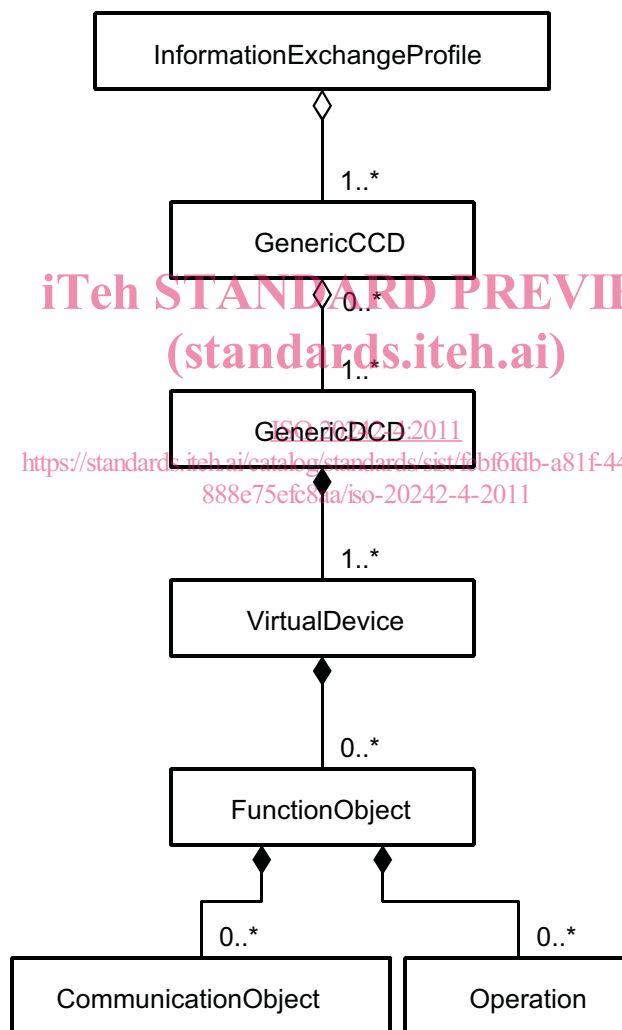


Figure 4 — Class diagram of generic DCPT model

The generic CCD is an abstract class that describes generic capabilities of a coordinator. The number of generic CCDs is equal to the number of coordinators.

A generic CCD contains generic DCDs. The generic DCD is an abstract class that describes generic capabilities of device drivers. The number of generic DCDs is equal to the number of device drivers.

A generic DCD contains virtual devices. The virtual device is an abstract class that describes generic capabilities of virtual devices.

A virtual device contains function objects. The function object is an abstract class that describes generic capabilities of functions of virtual devices.

A function object contains communication objects and operations.

The communication object is an abstract class that describes generic capabilities of communication objects defined in ISO 20242-3.

The operation is an abstract class that describes generic capabilities of operations defined in ISO 20242-3.

6.3 Generic DCPT XML schema

The generic DCPT XML schema in Figure 5 describes the information exchange profile template. The generic DCPT XML schema includes the generic CCD XML schema and refers to the generic CCD element. The DCPT header used in the annotation part of Figure 5 is defined in 7.2.

```

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns="http://www.osi.ch/iso/ISO20242-4/GenericDCPT"
  targetNamespace="http://www.osi.ch/iso/ISO20242-4/GenericDCPT"
  elementFormDefault="qualified">

  <xsd:annotation>
    <xsd:appinfo source="DCPTHeader.xsd">
      <DCPTHeader>
        <DCPTIdentification>GenericDCPT</DCPTIdentification>
        <DCPTRevision>1.0</DCPTRevision>
        <DCPTName>Generic DCPT</DCPTName>
        <DCPTSource>GenericDCPT.xsd</DCPTSource>
        <DCPTDate>2011-07-01</DCPTDate>
      </DCPTHeader>
    </xsd:appinfo>
  </xsd:annotation>

  <!-- * Include GenericCCD * -->
  <xsd:include schemaLocation="GenericCCD.xsd"/>

  <!-- * ISO15745 Profile Root * -->
  <xsd:element name="ISO15745Profile">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref="ProfileHeader"/>
        <xsd:element ref="ProfileBody"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>

  <!-- * HEADER DATA TYPES * -->
  <xsd:element name="ProfileHeader">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element name="ProfileIdentification" type="xsd:string"/>
        <xsd:element name="ProfileRevision" type="xsd:string"/>
        <xsd:element name="ProfileName" type="xsd:string"/>
        <xsd:element name="ProfileSource" type="xsd:string"/>
        <xsd:element name="ProfileClassID" type="ProfileClassID_DataType"
          fixed="InformationExchange"/>
        <xsd:element name="ProfileDate" type="xsd:date"
          minOccurs="0"/>
        <xsd:element name="AdditionalInformation" type="xsd:anyURI"
          minOccurs="0"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>

```

```

<xsd:element name="ISO15745Reference" type="ISO15745Reference_DataType"/>
<xsd:element name="IASInterfaceType" type="IASInterface_DataType"
    minOccurs="0" fixed="CSI" maxOccurs="unbounded"/>
</xsd:sequence>
</xsd:complexType>
</xsd:element>

<xsd:complexType name="ISO15745Reference_DataType">
<xsd:sequence>
<xsd:element name="ISO15745Part" type="xsd:string"
    fixed="1"/>
<xsd:element name="ISO15745Edition" type="xsd:string"
    fixed="1"/>
<xsd:element name="ProfileTechnology" type="xsd:string"
    fixed="None"/>
</xsd:sequence>
</xsd:complexType>

<xsd:simpleType name="ProfileClassID_DataType">
<xsd:restriction base="xsd:string">
<xsd:enumeration value="AIP"/>
<xsd:enumeration value="Process"/>
<xsd:enumeration value="InformationExchange"/>
<xsd:enumeration value="Resource"/>
<xsd:enumeration value="Device"/>
<xsd:enumeration value="CommunicationNetwork"/>
<xsd:enumeration value="Equipment"/>
<xsd:enumeration value="Human"/>
<xsd:enumeration value="Material"/>
</xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="IASInterface_DataType">
<xsd:union>
<xsd:simpleType>
<xsd:restriction base="xsd:string">
<xsd:enumeration value="CSI"/>
<xsd:enumeration value="HCI"/>
<xsd:enumeration value="ISI"/>
<xsd:enumeration value="API"/>
<xsd:enumeration value="CMI"/>
<xsd:enumeration value="ESI"/>
<xsd:enumeration value="FSI"/>
<xsd:enumeration value="MTI"/>
<xsd:enumeration value="SEI"/>
<xsd:enumeration value="USI"/>
</xsd:restriction>
</xsd:simpleType>
<xsd:simpleType>
<xsd:restriction base="xsd:string">
<xsd:length value="4"/>
</xsd:restriction>
</xsd:simpleType>
</xsd:union>
</xsd:simpleType>

<!-- * BODY SECTION * -->
<xsd:element name="ProfileBody">
<xsd:complexType>
<xsd:sequence>
<xsd:element ref="GenericCCD" maxOccurs="unbounded"/>
</xsd:sequence>
</xsd:complexType>
</xsd:element>
</xsd:schema>

```

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Figure 5 — Generic DCPT XML schema

The generic CCD XML schema in Figure 6 describes the generic CCD template. The generic CCD XML schema includes the generic DCD XML schema and refers to the generic DCD element. The DCPT header used in the annotation part of Figure 5 is defined in 7.2.

```

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns="http://www.osi.ch/iso/ISO20242-4/GenericDCPT"
  targetNamespace="http://www.osi.ch/iso/ISO20242-4/GenericDCPT"
  elementFormDefault="qualified">

  <xsd:annotation>
    <xsd:appinfo source="DCPTHeader.xsd">
      <DCPTHeader>
        <DCPTIdentification>GenericCCD</DCPTIdentification>
        <DCPTRevision>1.0</DCPTRevision>
        <DCPTName>Generic CCD</DCPTName>
        <DCPTSource>GenericCCD.xsd</DCPTSource>
        <DCPTDate>2011-07-01</DCPTDate>
      </DCPTHeader>
    </xsd:appinfo>
  </xsd:annotation>

  <!-- * Include GenericDCD * -->
  <xsd:include schemaLocation="GenericDCD.xsd"/>

  <!-- * Elements Declaration * -->
  <xsd:element name="GenericCCD" type="GenericCCDType" abstract="true"/>

  <xsd:complexType name="GenericCCDType" abstract="true">
    <xsd:sequence>
      <xsd:element ref="GenericDCD" maxOccurs="unbounded"/>
    </xsd:sequence>
    <xsd:attribute name="name" type="xsd:string"/>
    <xsd:attribute name="category" type="xsd:string"
      use="required" fixed="CCD"/>
  </xsd:complexType>
</xsd:schema>

```

Figure 6 — Generic CCD XML schema

The generic DCD XML schema in Figure 7 describes the generic DCD template. It includes templates of the virtual device, the function object, the communication object and the operation. The DCPT header used in the annotation part of Figure 5 is defined in 7.2.

```

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns="http://www.osi.ch/iso/ISO20242-4/GenericDCPT"
  targetNamespace="http://www.osi.ch/iso/ISO20242-4/GenericDCPT"
  elementFormDefault="qualified">

  <xsd:annotation>
    <xsd:appinfo source="DCPTHeader.xsd">
      <DCPTHeader>
        <DCPTIdentification>GenericDCD</DCPTIdentification>
        <DCPTRevision>1.0</DCPTRevision>
        <DCPTName>Generic DCD</DCPTName>
        <DCPTSource>GenericDCD.xsd</DCPTSource>
        <DCPTDate>2009-03-16</DCPTDate>
      </DCPTHeader>
    </xsd:appinfo>
  </xsd:annotation>

  <!-- * Elements Declaration * -->
  <xsd:element name="GenericDCD"
    type="GenericDCDType" abstract="true"/>

```