INTERNATIONAL STANDARD

ISO 18435-2

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Industrial automation systems and integration — Diagnostics, capability assessment and maintenance applications integration —

Part 2: Descriptions and definitions of application domain matrix elements

Systèmes d'automatisation industrielle et intégration — Diagnostics, évaluation des moyens et intégration des applications de maintenance —

Partie 2: Descriptions et définitions des éléments de matrice du domaine d'application

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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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 18435-2 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*.

ISO 18435 consists of the following parts, under the general title *Industrial automation systems and integration — Diagnostics, capability assessment and maintenance applications integration*:

— *Part 1: Overview and general requirements*

— *Part 2: Descriptions and definitions of application domain matrix elements*

The following part is under preparation:

— *Part 3: Applications integration description method*

Introduction

The relationship between the different parts of ISO 18435 is illustrated in Figure 1. The focus of each part is indicated by dotted lines that bound specific portions of the unified modeling language (UML) class diagram representing the integration model for an application and between applications.

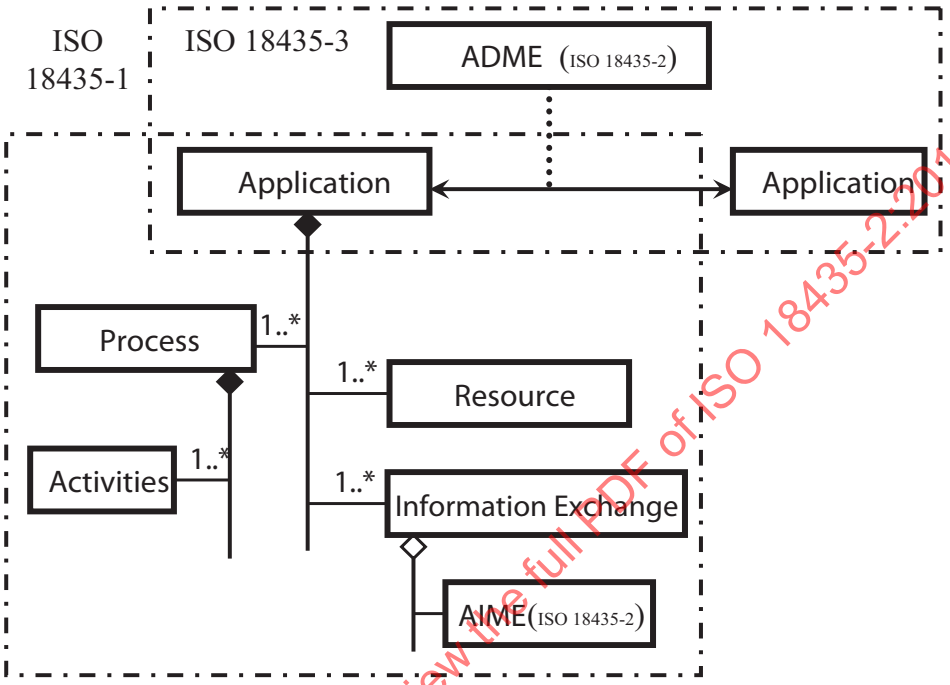

Figure 1 — Relationship between the different parts of ISO 18435

ISO 18435-1 provides an overview of the elements and the rules of a method to describe an automation application's integration requirements. The elements include the key aspects when integrating an automation application with other applications and the relationships of these key aspects. The rules include the information exchanges to support interoperability within an application and between applications. The focus is on the production operations and maintenance operations domains, including the capability assessment activities.

This part of ISO 18435 provides the detailed definitions of the application interaction matrix element (AIME) and application domain matrix element (ADME) structures and their relationships. In particular, the steps for constructing an ADME that can be supported by a specific combination of a set of AIMEs are described.

ISO 18435-3 defines a recommended method to describe the interoperability and integration requirements between applications in two or more automation domains within an enterprise. The focus is on the production operations and maintenance operations domains, including the capability assessment activities.

Industrial automation systems and integration — Diagnostics, capability assessment and maintenance applications integration —

Part 2:
Descriptions and definitions of application domain matrix elements

1 Scope

This part of ISO 18435 defines the structures and templates for

— an application interaction matrix element;

— an application domain matrix element.

This part of ISO 18435 also defines the relationship between these types of elements.

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 18435-1, *Industrial automation systems and integration — Diagnostics, capability assessment and maintenance applications integration — Part 1: Overview and general requirements*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18435-1 and the following apply.

3.1
application domain matrix
matrix depicting application domains

3.2
application domain matrix element
ADME
entry in an application domain matrix to organize information exchange among applications

3.3
application interaction matrix
AIM
matrix depicting information exchange among resources

3.4
application interaction matrix element
AIME
entry in application interaction matrix to denote the capabilities of the resource to support information exchange

3.5
application interoperability profile
AIP
single specification referencing a group of profiles that reference parts of base specifications which may themselves be profiles

NOTE The group of profiles can include process profile(s), information exchange profile(s), resource profile(s) and sometimes other AIPs.

3.6
capability
ability to perform actions, including attributes on qualifications and measures of the ability

NOTE If the software resource type is MSU (manufacturing software unit) as in ISO 16100, then the definition of capability is the same as defined in ISO 16100-1.

4 Abbreviated terms

ADID	Application Domain Integration Diagram
ADME	Application Domain Matrix Element
AIM	Application Interaction Matrix
AIME	Application Interaction Matrix Element
AIP	Application Interoperability Profile
CM	Condition Monitoring
DA	Data Acquisition
DM	Data Manipulation
NC	Numerical Controller
RC	Robot Controller
SD	State Detection
UML	Unified Modeling Language
XML	eXtensible Mark-up Language

5 Overview of application interaction matrix element (AIME) and application domain matrix element (ADME)

5.1 Concept of AIME and ADME

This part of ISO 18435 provides a detailed definition of AIME and ADME. The general concept of an ADME is to model the information exchanges between applications as shown in Figure 2 using the application interoperability profile notation that shall be as described in ISO 15745-1.

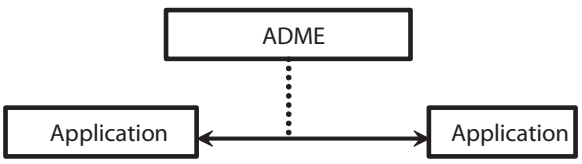

Figure 2 — Application domain matrix element

The ADME, which shall be as defined in ISO 18435-1, uses a description method for detailing the information exchanges between the applications. For each application, a set of interfaces shall be described using the AIME. The AIME enumerates the interface profiles supported by the application and its corresponding resources as shown in Figure 3.

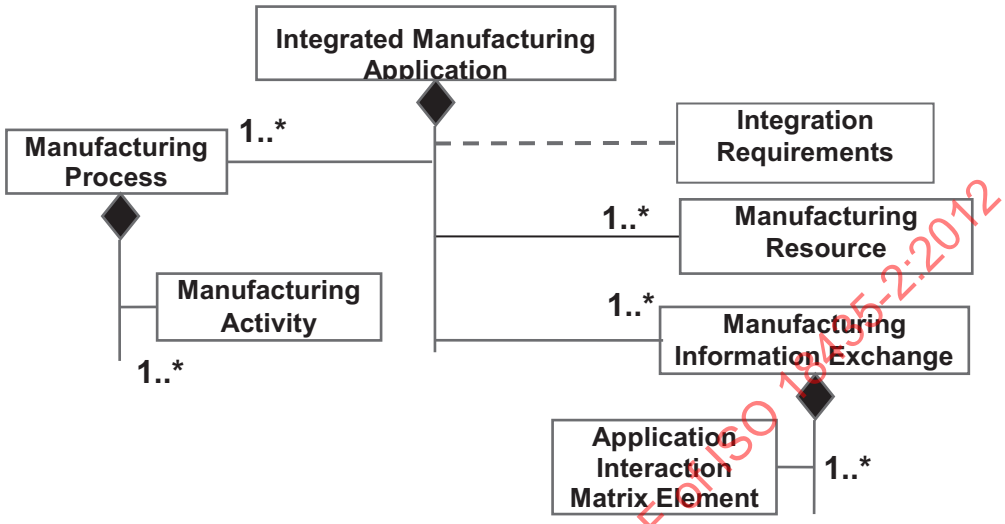

Figure 3 — AIME concept

An AIME enumerates those resource capabilities, including interfaces, as noted in each application interoperability profile. An application may have one or more AIMEs to support all the information exchanges involving the application.

The set of AIMEs representing the resource capabilities that meet the information exchange requirements to support the interoperability of two applications shall comprise a key part of an ADME.

An ADME that qualifies interoperability relationship between two applications noted in Figures 1 and 2 is further elaborated in Figure 4. The ADME is constructed from interoperability profiles referenced in AIMEs. AIMEs used for constructing ADME express compatibility of resources to support necessary information exchange between applications to achieve interoperability.

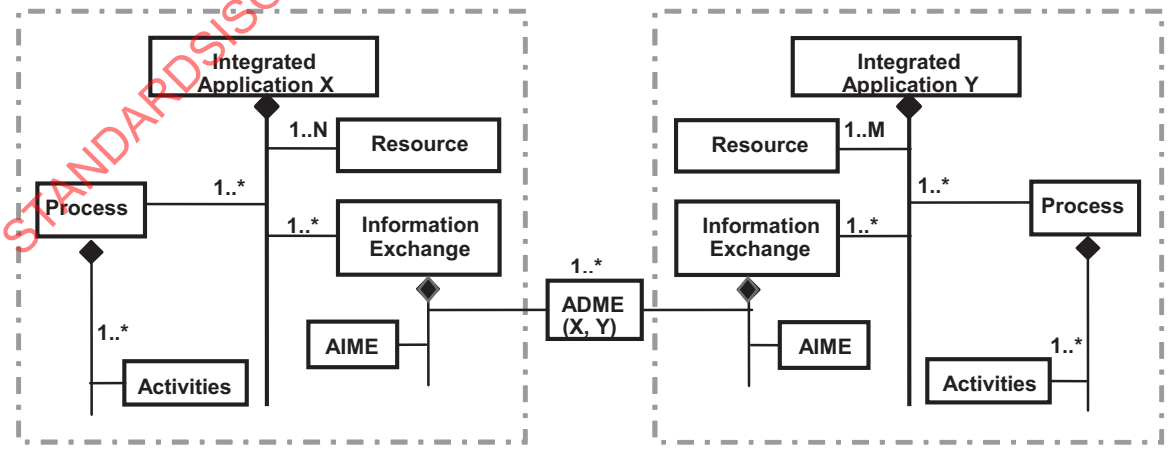

Figure 4 — Interoperability of applications

5.2 Information exchanges between resources

The manufacturing resources form an integrated system and enable a process that involves required flows of material, information and energy. The interoperability of the resources requires the use of compatible interfaces. These interfaces shall be configured to support characteristics of the flows between the resources. The integration requirement of realizing the required flows constrains the resource interfaces.

Each flow can be modelled as a detailed UML sequence diagram showing the resources involved. Each transfer between resources can be associated with a type of interface that is configured and deployed in each resource participating in the particular transfer.

To support the information flows between the manufacturing resources, the information exchange interfaces shall be configured in a compatible manner.

The interoperability of the resources is enabled by a set of information exchange interfaces. The number and the type of interfaces required to support the information exchanges are assumed to be available and configured appropriately in each resource participating in the information exchanges.

NOTE 1 Media-level interface types for information exchanges are transducer interfaces for physical signal acquisition and actuation, human-machine interfaces for operator commands and displays, and communications network interfaces for devices. Content-level interface services handle data type, structure, sequence, timing and semantics of the information item exchanged.

Each information exchange interface shall be associated with a set of required information handling services, where each service shall offer a particular grade of service and a specific quality of service. These interfaces enable the interoperability of the resources whenever information items need to be exchanged in a specified sequence, timing, throughput, latency, physical extent, fidelity and security.

NOTE 2 Conditions to be supported by the resources can consist of:

— exchanges at, before, after, or during, a certain time, period of time, event, or rate; or

— exchanges at, by, or within, a certain, volume of space, or location.

To support all the information exchanges of all the activities in each manufacturing process, each and every manufacturing resource participating in the manufacturing process shall provide a required set of interoperability interfaces. For each resource, the set of interfaces and configuration settings can be denoted in a resource interoperability profile, as defined in ISO 15745.

6 Application interaction matrix element (AIME)

6.1 AIME concept

In Figure 3, each manufacturing application shall be associated with a set of manufacturing resources that are deployed to perform a corresponding set of information exchanges. An AIME shall represent a set of capabilities provided by a set of resources of an application, in order to exchange information with another set of resources associated with another application.

In an AIME corresponding to a single resource, the set of information items that may be transferred from this resource to another resource shall be a subset of the information items defined in the application denoted in the AIME.

An interface specified in an AIME may support multiple information item transfers with another resource. These information transfers may be represented by a UML sequence diagram.

Each information exchange description may include the characteristics of the information being exchanged, the frequency and the latency of the exchange, the criticality of the exchange and the resources involved. For instance, an AIME associated with a single resource may specify a list of information exchange descriptions that the resource is able to perform.

An AIM shall consist of a set of AIMEs to represent the complete set of information exchange requirements among all the resources in a process, and these AIMEs shall denote the information exchange interfaces required to coordinate the execution of the process.

An application consisting of a set of processes can be associated with a set of AIMEs specifying the information exchange capabilities of its resources. These AIMEs denote the capability of an application to conduct information exchanges with other applications.

6.2 AIME formal structure

6.2.1 General

An AIME represents a capability of an entity acting as a source to convey a set of information items to another entity acting as a destination. The matrix element corresponds to a particular information flow between two actors in a UML sequence diagram. The information exchange can also be illustrated in terms of activity diagrams, as well as state diagrams.

The structure of an AIME shall consist of two parts: a header and a body. The body further consists of a context section and a conveyance section. Each section may be represented as an XML schema segment.

6.2.2 AIME template header

The AIME template header section defines the attributes in Table 1.

Table 1 — AIME template header attributes

Attribute	Description	Example
MEidentification	AIME identification	ISO_AIME
MErevision	Revision of the AIME	V01.01.01a
MEname	Descriptive name of the AIME	D.2.2.Ay_D.2.2Az
MEsource	Identification of the AIME developer	AIMEsrc
MEclassID	Identification of the AIME class	AIP
MEdate	The release data of this version of the AIME	2007-03-29
MEregistry	Registry name for this AIME	Industry_specific_registry_name

6.2.3 AIME template context section

The AIME context section defines the attributes in Table 2.

Table 2 — AIME context section

Section	Description	Example
domainSection	Domain ID where the source application is resident Domain ID where the destination application is resident	Asset_Health_Assessment_domain Asset_Health_Assessment_domain
applicationSection	Application ID corresponding to the source application Application ID corresponding to the destination application	Health_assessment Prognostics
applicationRelationshipSection	Application domain specific context(s)	Condition_Monitoring_Context
processSection	Process ID associated with the source Resource Process ID associated with the destination Resource	Current_health_grade_evaluation Future_health_grade_evaluation
resourceSection - resourcePack	Resource Pack Name Resource name Available or planned capability profiles in the resource	PLC01 MotionDrive CIP_ISO_15745_profile

6.2.4 AIME template conveyance section

The AIME conveyance section defines the attributes in Table 3.

Table 3 — AIME conveyance section

Section	Description	Example
informationType	Types of information exchanged	CavitationInformationRequest
roleType	Enumeration of capabilities exhibited by the participant for a particular information exchange	PumpControlRole CavitationDetectionRole
relationshipType	Identifies the application role types and behaviour	CavitationDetection2PumpControl
participantType	Types of collaborating parties for information exchange	CavitationDetection
channelType	Point of information item exchange between participants	CIP_FTLD_channel

6.3 Graphical representation of the AIME

Graphical representations of the AIME are shown in Figures 5, 6 and 7. These figures follow the convention described in ISO/IEC 29500-2.

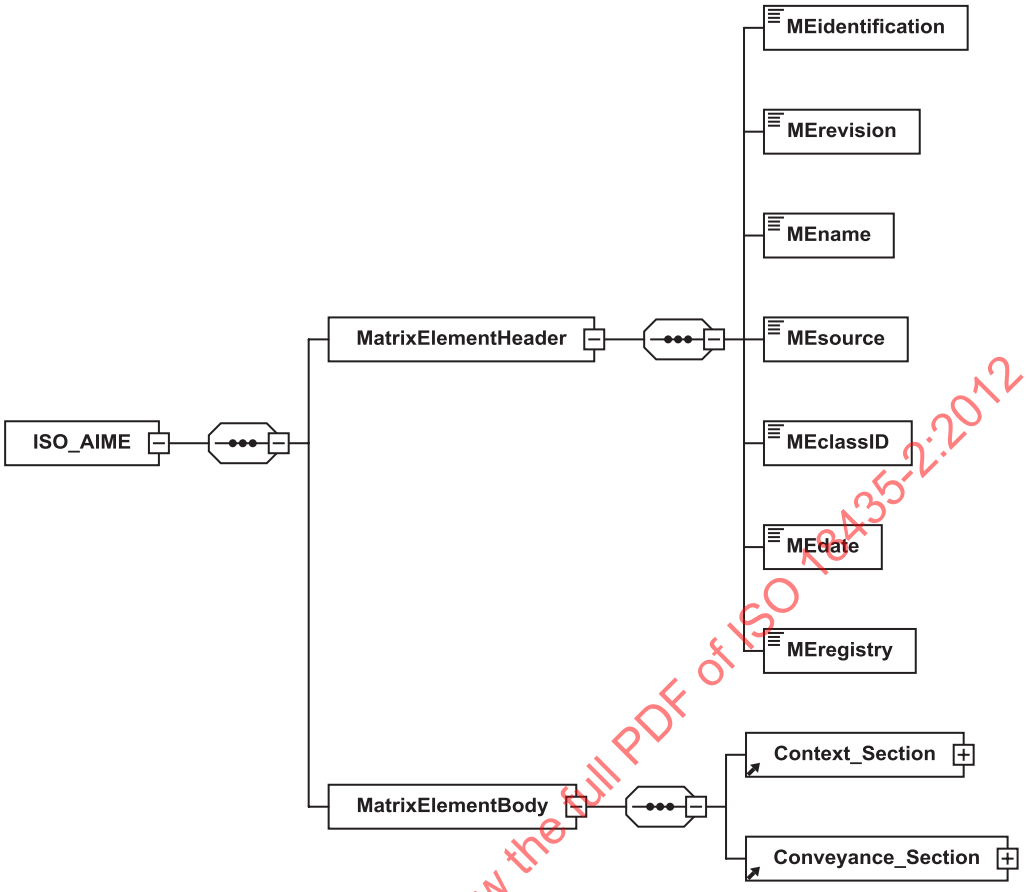

Figure 5 - AIME matrix element header and matrix element body

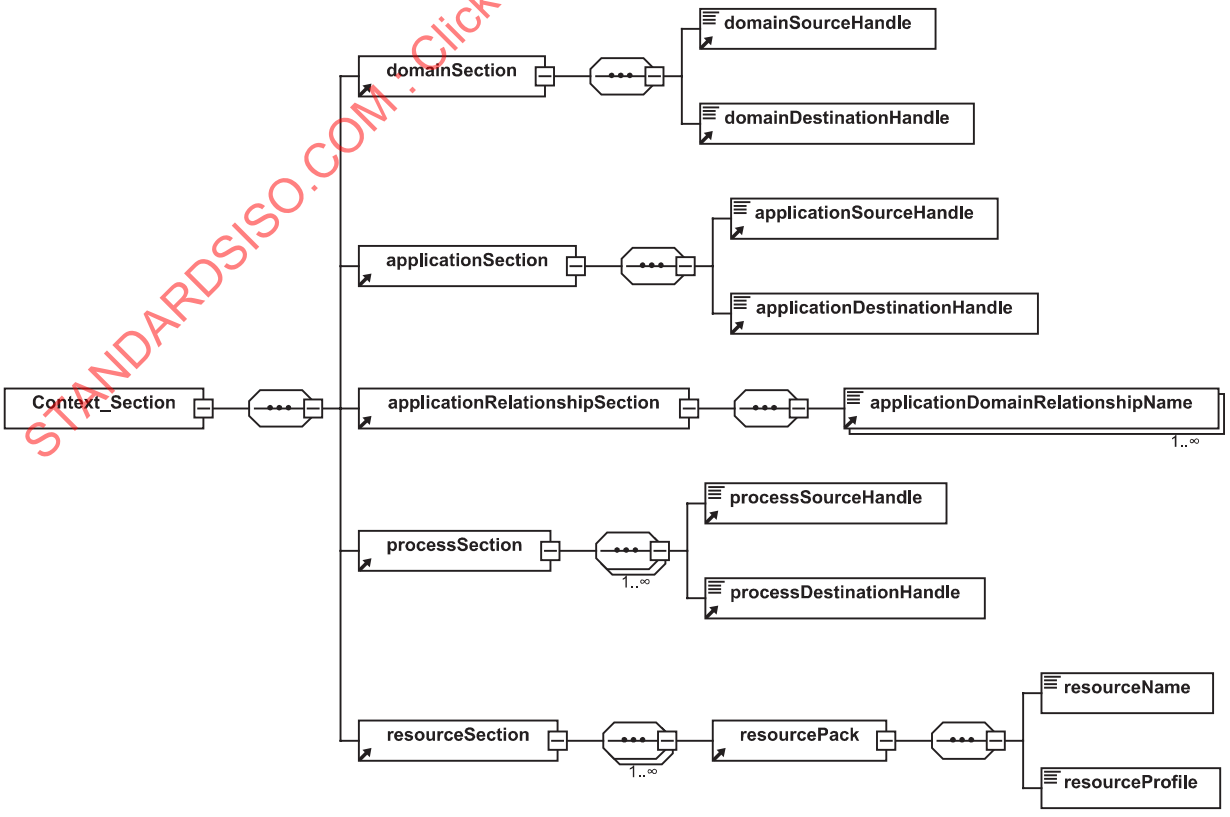

Figure 6 - AIME context section

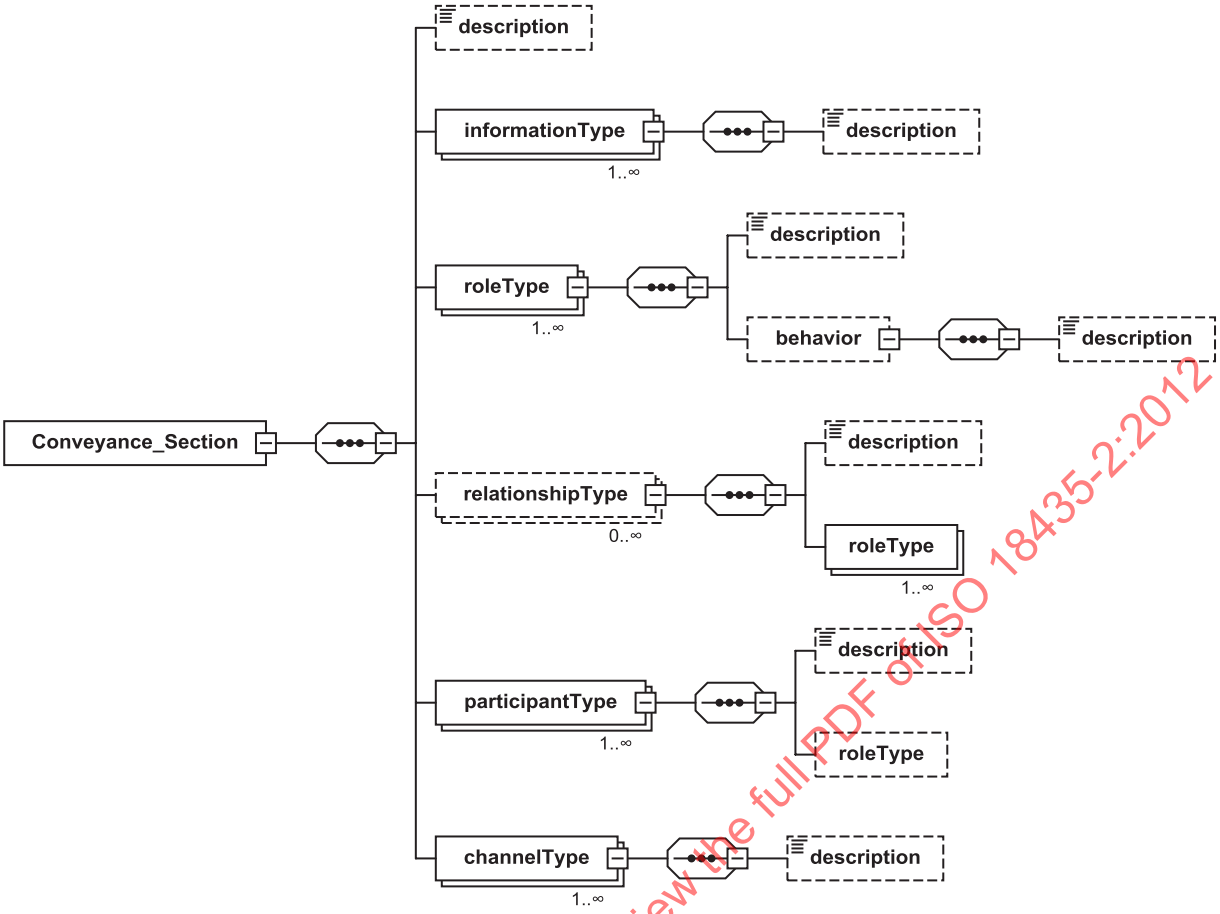

Figure 7 - AIME conveyance section

The formal AIME template structure shall be as defined in Annex A.

6.4 Purpose of AIME in an integrated application

The purpose of an AIME is to express the information exchange capabilities of the resources in an application. The AIME can be used to facilitate the task of verifying whether the resources of an application can support specific information exchanges with a set of particular resources in another application.

7 Application domain matrix element (ADME)

7.1 ADME concept

The purpose of the ADME is to describe the interoperability and integration requirements that are required by the applications as shown in Figure 8.

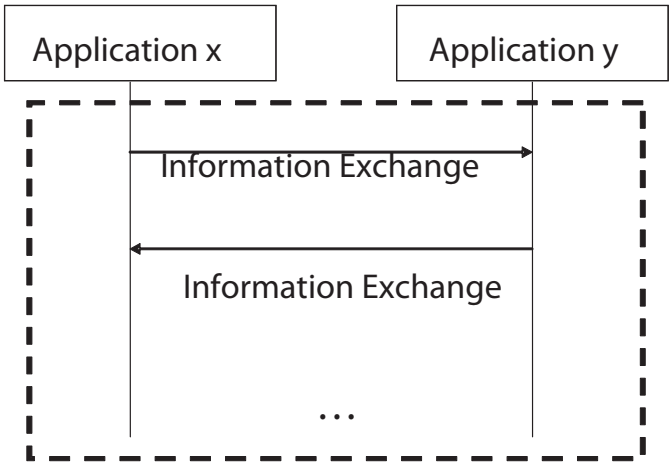

Figure 8 — Purpose of the ADME

The ADME supports the information exchange between the applications based upon the capabilities identified in the AIMEs.

The information exchanges between applications will be described using a path description method. A set of path descriptions shall be represented by an ADME and corresponding profiles. This description method distinguishes the source entity, the destination entity, as well as the other attributes of the exchange, such as constraints, types of exchange and interface type.

The complete set of AIMEs that represents the information exchange requirements for realizing the interoperability of two applications shall comprise an ADME. As shown in ISO 18435-1:2009, Figure 7, some of the resources in each application are involved in conducting these information exchanges between the applications. Each application remains integrated while conducting information exchanges with another application.

7.2 ADME structure

7.2.1 General

The ADME element represents information transfer involving a set of information records, which is defined in the ADME template between source and destination entity. The contents are organized using a schema which represents elements in the diagram and relationships.

The structure of an ADME shall consist of two parts: a header and a body. The body further consists of a context, a conveyance and a content section. Each section may be represented as an XML schema segment.

7.2.2 ADME template header

The ADME header section defines the attributes in Table 4.

Table 4 — ADME template header attributes

Attribute	Description	Example
MEidentification	ADME identification	ISO_ADME
MErevision	Revision of the ADME	V01.01.01a
MEname	Descriptive name of the ADME	D.2.2.Ay_D.2.2Az
MEsource	Identification of the ADME developer	ADMEsrc
MEclassID	Identification of the ADME class	AIP
MEdate	The release data of this version of the ADME	2007-03-29
MEregistry	Registry name for this ADME	Industry_specific_registry_name

7.2.3 ADME template context section

The ADME context section defines the attributes in Table 5.

Table 5 — ADME template context section

Section	Description	Example
domainSection	Domain ID where the source application is resident Domain ID where the destination application is resident	Asset_Health_Assessment_domain Asset_Health_Assessment_domain
applicationSection	Application ID corresponding to the source application Application ID corresponding to the destination application	Health_assessment Prognostics
applicationRelationshipSection	Application domain specific context(s)	Robot_Control_Context
processSection	Process ID associated with the source Resource Process ID associated with the destination Resource	Current_health_grade_evaluation Future_health_grade_evaluation
resourceSection - resourcePack	Resource Pack Name Resource name Available or planned capability profiles in the resource	PLC01 MotionDrive CIP_ISO_15745_profile

7.2.4 ADME template conveyance section

The ADME conveyance section defines the attributes in Table 6.

Table 6 — ADME template conveyance section

Section	Description	Example
informationType	Types of information exchanged	CavitationInformationRequest
roleType	Enumeration of capabilities exhibited by the participant for information exchange. Behaviour captures the elementary interactions of the participant by interface	PumpControlRole CavitationDetectionRole
relationshipType	Identifies the role types and behaviors	CavitationDetection2PumpControl
participantType	Types of collaborating parties for information exchange	CavitationDetection
channelType	Describes the medium used to exchange information between two role types	CIP_FTLD_channel

7.2.4.1 ADME template information exchange section

The ADME information exchange section defines the attributes in Table 7.

Table 7 — ADME template information exchange section

Section	Description	Example
Name	Name of the information exchange	SmartPumpInformationExchange
relationship	Relationship type for information exchange	PumpControl2CavitationDetection
variableDefinitions	definitions for the variables used for information exchange	DiagRequest CavDetectionResponse

7.2.4.2 ADME template interaction section

The ADME interaction section defines the attributes in Table 8.

Table 8 — ADME template interaction section attributes

Section	Description	Example
Name	Name of the interaction	CavitationInformationElicitation
exchange	basic unit of information exchange interaction	CavitationInformationRequest
send/receive	Send/receive information per action defined in exchange using variables	

7.2.5 Graphical representation of the ADME

Graphical representations of the ADME are shown in Figures 9 to 13. These figures follow the convention described in ISO/IEC 29500-2. These figures illustrate Tables 5 to 8, and the XML schema in Clause A.2.

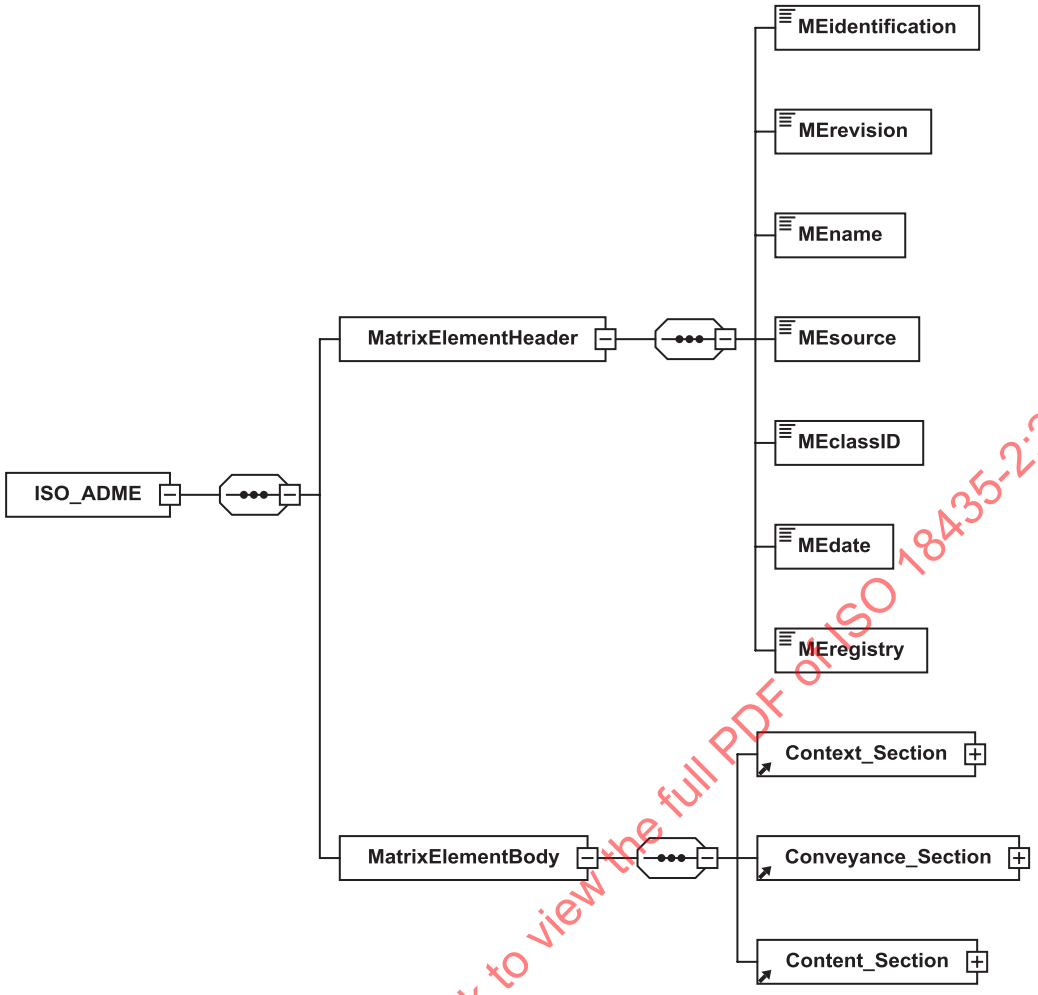

Figure 9 – ADME matrix element header and matrix element body

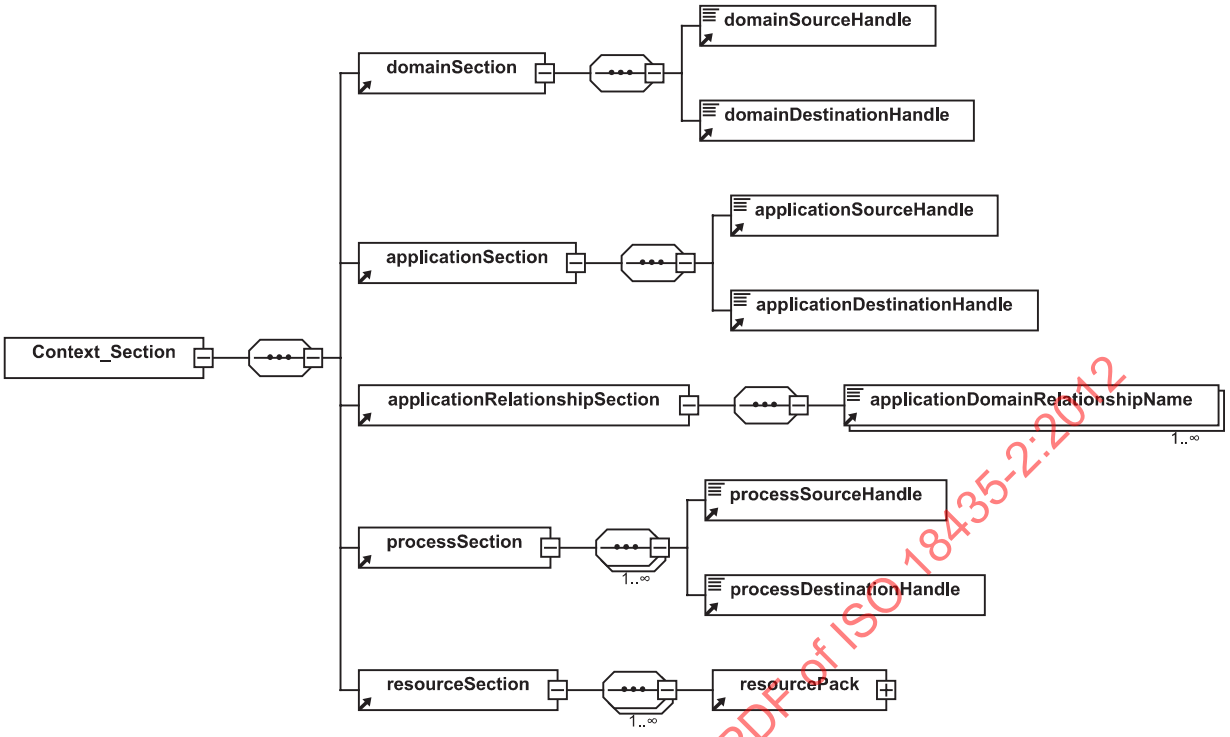

Figure 10 - ADME context section

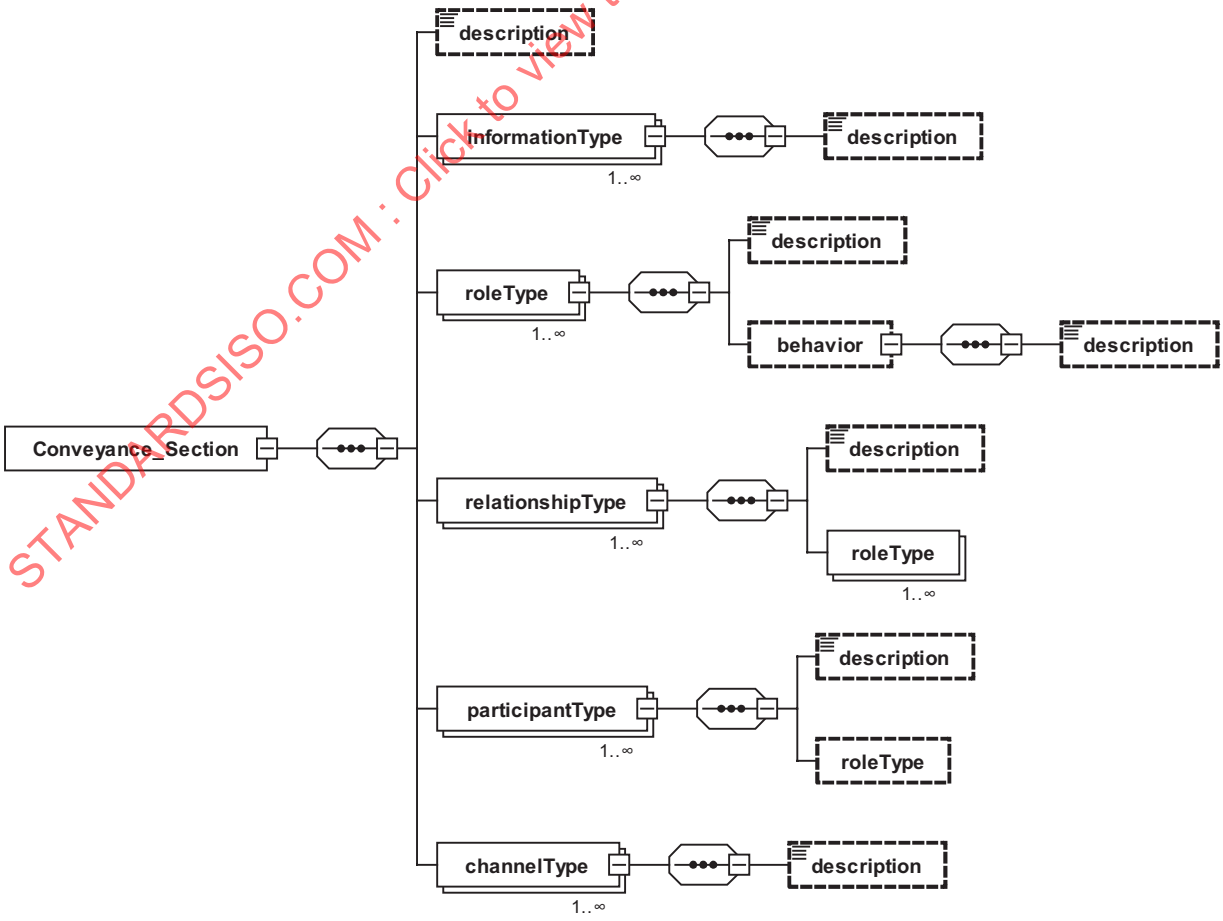

Figure 11 - ADME conveyance section

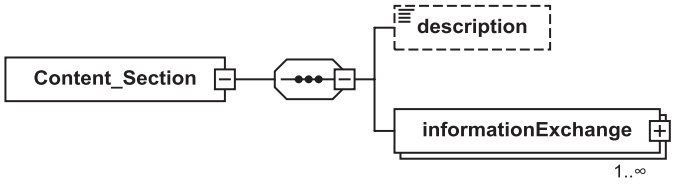

Figure 12 - ADME content section

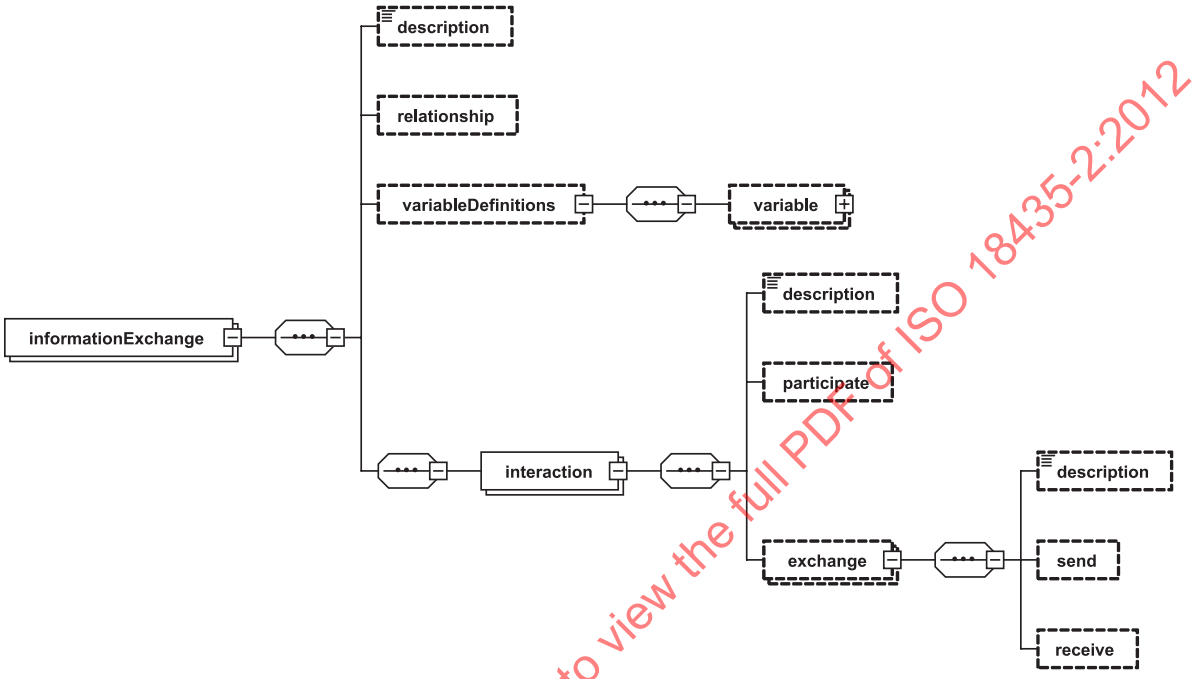

Figure 13 - ADME information exchange

The formal ADME template structure shall be as defined in Annex A.

8 AIME and ADME construction

The general procedure for constructing AIME and ADME shall be as follows:

a) define the applications;

b) allocate to the domain integration diagram – retrieving/assigning domain numbers to ADID;

c) identify the assets and resources, then allocate them to the applications;

d) define the information exchanges;

e) identify the interfaces required in terms of ISO 15745 templates to reference the corresponding profile;

f) fill out the AIMEs for each application being described;

g) use AIMEs to construct ADMEs that capture the interoperability requirements between the applications.

EXAMPLE In Figure 14, in order to identify the necessary AIME(s) for integrating the applications, the resources involved for the integration are classified into two groups: the resource which executes the application and the resource which is maintained or operated by the application. The rest of the resources are not considered. Once the resources are classified and the roles and participation identified, the applications are associated with these two groups of resources.

Figure 14 illustrates how to identify necessary AIMEs and ADMEs for a particular integration scenario. This example shows the interaction among data acquisition (DA), data manipulation (DM) and state detection (SD) application as defined in ISO 13374.

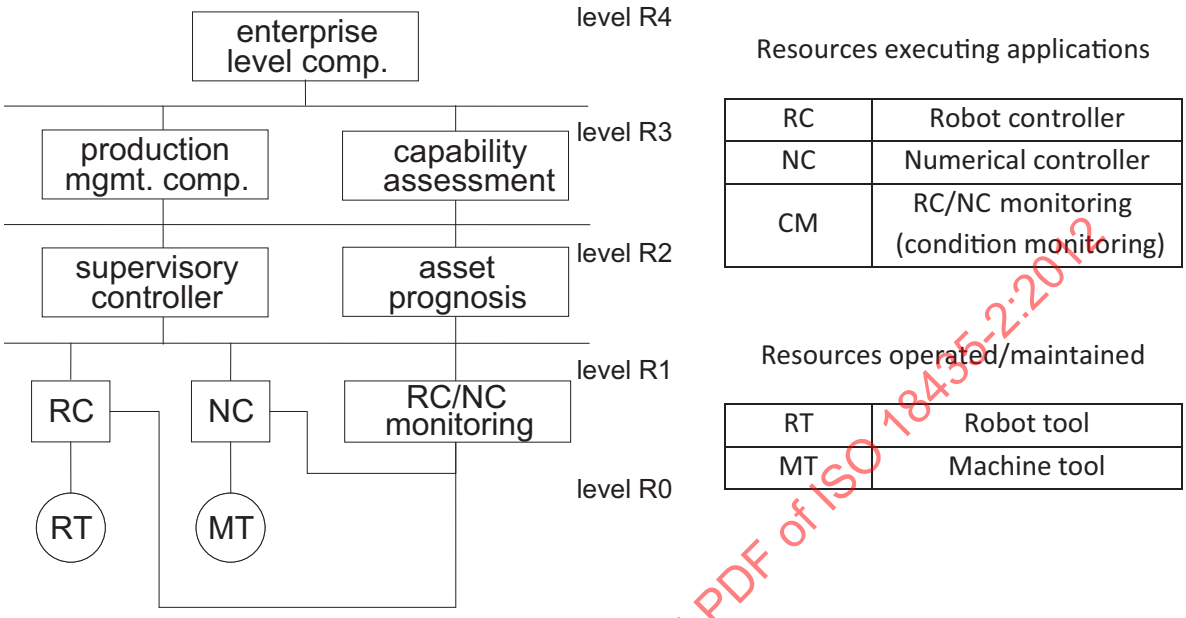

Figure 14 —Integration scenario example

The necessary ADMEs are marked by an "X" in Table 9. In this integration scenario, three different types of applications are identified (DA, DM and SD, in accordance with ISO 13374) and three different types of relevant resources are identified [robot controller (RC), numerical controller (NC) and condition monitoring (CM)]. In this integration scenario, there are four ADMEs altogether, i.e. one ADME is necessary for each of the following:

— DA being executed on RC to DM being executed on CM;

— DM being executed on RC to SD being executed on CM;

— DA being executed on NC to DM being executed on CM;

— DM being executed on NC to SD being executed on CM.

Table 9 illustrates the information flow from row (source) to column (destination). For example, the levels R0 to R4 in Figure 14 are related to the ADID diagram of ISO 18435-1:2009, Figure 5.

Table 9 — Necessary ADMEs for the integration

Resource	destination	RC			NC			CM	
source	Application	DA	DM	SD	DA	DM	SD	DM	SD
RC	DA							X	
	DM								X
	SD								
NC	DA							X	
	DM								X
	SD								
CM	DM								
	SD								

The necessary sets of AIMEs for this integration scenario are marked by an “X” in Table 10. One set of AIMEs is necessary for the resource RC to CM and the other set for the resource NC to CM. Examples of the AIMEs and the ADME for the RC to CM application are included in Annex B.

Table 10 — Necessary AIMEs for the integration

Resource	RC	NC	CM
RC			X
NC			X
CM			

9 Conformance and compliance

9.1 Conformance aspects

Conformance with this part of ISO 18435 shall be stated by implementation providers in accordance with the following guidelines:

a) a conformance statement shall declare which clauses in this part of ISO 18435 are referenced in a particular implementation;

b) when several clauses in this part need to be implemented as a group, these set of clauses shall be referenced as a group in a particular implementation;

c) certain diagrams in this part of ISO 18435 that have been constructed in accordance with UML conventions shall be part of a conformance statement, as needed.

9.2 Compliance aspects

Compliance with this part of ISO 18435 shall be stated by specification providers in accordance with the following guidelines:

a) the purpose of a compliance statement shall be to declare which clauses in this part of ISO 18435 are referenced in a particular specification;

b) when several clauses in this part need to be referenced as a group, these set of clauses shall be referenced as a group in a particular specification;

c) certain diagrams in this part of ISO 18435 that have been constructed in accordance with UML conventions shall be part of a compliance statement, as needed.

Annex A
(normative)

Formal ADME/AIME schema

A.1 AIME schema

The formal definition of AIME is as follows:

```
<?xml version="1.0" encoding="utf-8" ?>
<schema xmlns:aime="http://www.iso.org/aime" elementFormDefault="qualified" targetNamespace="http://
www.iso.org/aime" xmlns="http://www.w3.org/2001/XMLSchema">
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    <complexType>
      <sequence>
        <element name="MatrixElementHeader">
          <complexType>
            <sequence>
              <element name="MEidentification" type="string" />
              <element name="MErevision" type="string" />
              <element name="MEname" type="string" />
              <element name="MEsource" type="string" />
              <element name="MEclassID" type="string" />
              <element name="MEdate" type="string" />
              <element name="MEregistry" type="anyURI" />
            </sequence>
          </complexType>
        </element>
        <element name="MatrixElementBody">
          <complexType>
            <sequence>
              <element ref="aime:Context _ Section" />
              <element ref="aime:Conveyance _ Section" />
            </sequence>
          </complexType>
        </element>
      </sequence>
    </complexType>
  </element>
  <element name="Context _ Section">
    <complexType>
      <sequence>
        <element ref="aime:domainSection" />
        <element ref="aime:applicationSection" />
        <element ref="aime:applicationRelationshipSection" />
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  </element>
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        </element>
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```

```
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            <element minOccurs="0" name="behavior">
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      </element>
      <element minOccurs="0" maxOccurs="unbounded" name="relationshipType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
            <element maxOccurs="unbounded" name="roleType">
              <complexType>
                <attribute name="typeRef" type="string" use="optional" />
              </complexType>
            </element>
          </sequence>
          <attribute name="name" type="string" use="optional" />
        </complexType>
      </element>
      <element maxOccurs="unbounded" name="participantType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
            <element minOccurs="0" name="roleType">
              <complexType>
                <attribute name="typeRef" type="string" use="optional" />
              </complexType>
            </element>
          </sequence>
          <attribute name="name" type="string" use="optional" />
        </complexType>
      </element>
      <element maxOccurs="unbounded" name="channelType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
          </sequence>
          <attribute name="name" type="string" use="optional" />
          <attribute name="type" type="string" use="optional" />
        </complexType>
      </element>
    </sequence>
  </complexType>
</element>
<element name="domainSection">
  <complexType>
    <sequence>
      <element ref="aime:domainSourceHandle" />
      <element ref="aime:domainDestinationHandle" />
    </sequence>
  </complexType>
</element>
<element name="applicationSection">
  <complexType>
    <sequence>
      <element ref="aime:applicationSourceHandle" />
      <element ref="aime:applicationDestinationHandle" />
    </sequence>
  </complexType>
</element>
<element name="applicationRelationshipSection">
  <complexType>
    <sequence>
      <element maxOccurs="unbounded" ref="aime:applicationDomainRelationshipName" />
    </sequence>
```

```
    </complexType>
  </element>
  <element name="processSection">
    <complexType>
      <sequence maxOccurs="unbounded">
        <element ref="aime:processSourceHandle" />
        <element ref="aime:processDestinationHandle" />
      </sequence>
    </complexType>
  </element>
  <element name="resourceSection">
    <complexType>
      <sequence maxOccurs="unbounded">
        <element ref="aime:resourcePack" />
      </sequence>
    </complexType>
  </element>
  <element name="resourcePack">
    <complexType>
      <sequence>
        <element name="resourceName" type="string" />
        <element name="resourceProfile" type="anyURI" />
      </sequence>
      <attribute name="name" type="string" />
    </complexType>
  </element>
  <element name="domainSourceHandle" type="string" />
  <element name="domainDestinationHandle" type="string" />
  <element name="applicationSourceHandle" type="string" />
  <element name="applicationDestinationHandle" type="string" />
  <element name="applicationDomainRelationshipName" type="string" />
  <element name="applicationProfileID" type="string" />
  <element name="processSourceHandle" type="string" />
  <element name="processDestinationHandle" type="string" />
</schema>
```

A.2 ADME schema

The formal definition of ADME is as follows:

```
<?xml version="1.0" encoding="utf-8" ?>
<schema xmlns:adme="http://www.iso.org/adme" elementFormDefault="qualified" targetNamespace="http://
www.iso.org/adme" xmlns="http://www.w3.org/2001/XMLSchema">
  <element name="ISO_ADME">
    <complexType>
      <sequence>
        <element name="MatrixElementHeader">
          <complexType>
            <sequence>
              <element name="MEidentification" type="string" />
              <element name="MErevision" type="string" />
              <element name="MEname" type="string" />
              <element name="MEsource" type="string" />
              <element name="MEclassID" type="string" />
              <element name="MEdate" type="string" />
              <element name="MEregistry" type="anyURI" />
            </sequence>
          </complexType>
        </element>
        <element name="MatrixElementBody">
          <complexType>
            <sequence>
              <element ref="adme:Context_Section" />
              <element ref="adme:Conveyance_Section" />
              <element ref="adme:Content_Section" />
            </sequence>
          </complexType>
        </element>
      </sequence>
    </complexType>
  </element>
  <element name="Context_Section">
    <complexType>
```

```
    <sequence>
      <element ref="adme:domainSection" />
      <element ref="adme:applicationSection" />
      <element ref="adme:applicationRelationshipSection" />
      <element ref="adme:processSection" />
      <element ref="adme:resourceSection" />
    </sequence>
  </complexType>
</element>
<element name="Conveyance _ Section">
  <complexType>
    <sequence>
      <element minOccurs="0" name="description" type="string" />
      <element maxOccurs="unbounded" name="informationType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
          </sequence>
          <attribute name="name" type="string" use="optional" />
          <attribute name="type" type="string" use="optional" />
        </complexType>
      </element>
      <element maxOccurs="unbounded" name="roleType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
            <element minOccurs="0" name="behavior">
              <complexType>
                <sequence>
                  <element minOccurs="0" name="description" type="string" />
                </sequence>
                <attribute name="name" type="string" use="optional" />
                <attribute name="interface" type="anyURI" use="optional" />
              </complexType>
            </element>
          </sequence>
          <attribute name="name" type="string" use="optional" />
        </complexType>
      </element>
      <element maxOccurs="unbounded" name="relationshipType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
            <element maxOccurs="unbounded" name="roleType">
              <complexType>
                <attribute name="typeRef" type="string" use="optional" />
              </complexType>
            </element>
          </sequence>
          <attribute name="name" type="string" use="optional" />
        </complexType>
      </element>
      <element maxOccurs="unbounded" name="participantType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
            <element minOccurs="0" name="roleType">
              <complexType>
                <attribute name="typeRef" type="string" use="optional" />
              </complexType>
            </element>
          </sequence>
          <attribute name="name" type="string" use="optional" />
        </complexType>
      </element>
      <element maxOccurs="unbounded" name="channelType">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
          </sequence>
          <attribute name="name" type="string" use="optional" />
          <attribute name="type" type="string" use="optional" />
        </complexType>
```

```
      </element>
    </sequence>
  </complexType>
</element>
<element name="Content _ Section">
  <complexType>
    <sequence>
      <element minOccurs="0" name="description">
        <complexType>
          <simpleContent>
            <extension base="string">
              <attribute name="type" type="string" use="optional" />
            </extension>
          </simpleContent>
        </complexType>
      </element>
      <element maxOccurs="unbounded" name="informationExchange">
        <complexType>
          <sequence>
            <element minOccurs="0" name="description" type="string" />
            <element minOccurs="0" name="relationship">
              <complexType>
                <attribute name="type" type="string" use="optional" />
              </complexType>
            </element>
            <element minOccurs="0" name="variableDefinitions">
              <complexType>
                <sequence>
                  <element minOccurs="0" maxOccurs="unbounded" name="variable">
                    <complexType>
                      <sequence>
                        <element minOccurs="0" name="description" type="string" />
                      </sequence>
                      <attribute name="name" type="string" use="optional" />
                      <attribute name="channelType" type="string" use="optional" />
                      <attribute name="roleTypes" type="string" use="optional" />
                      <attribute name="informationType" type="string" use="optional" />
                    </complexType>
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                </sequence>
              </complexType>
            </element>
            <sequence>
              <element maxOccurs="unbounded" name="interaction">
                <complexType>
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                    <element minOccurs="0" name="description" type="string" />
                    <element minOccurs="0" name="participate">
                      <complexType>
                        <attribute name="relationshipType" type="string" use="optional" />
                        <attribute name="fromRoleTypeRef" type="string" use="optional" />
                        <attribute name="toRoleTypeRef" type="string" use="optional" />
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                    <element minOccurs="0" maxOccurs="unbounded" name="exchange">
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                          <element minOccurs="0" name="send">
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                            </complexType>
                          </element>
                          <element minOccurs="0" name="receive">
                            <complexType>
                              <attribute name="variable" type="string" use="optional" />
                            </complexType>
                          </element>
                        </sequence>
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                        <attribute name="informationType" type="string" use="optional" />
                        <attribute name="action" type="string" use="optional" />
                      </complexType>
```

```
                    </element>
                  </sequence>
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    </sequence>
  </complexType>
</element>
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      <element ref="adme:domainDestinationHandle" />
    </sequence>
  </complexType>
</element>
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  <complexType>
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    </sequence>
  </complexType>
</element>
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  <complexType>
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  </complexType>
</element>
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      <element ref="adme:processSourceHandle" />
      <element ref="adme:processDestinationHandle" />
    </sequence>
  </complexType>
</element>
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    <sequence maxOccurs="unbounded">
      <element ref="adme:resourcePack" />
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  </complexType>
</element>
<element name="resourcePack">
  <complexType>
    <sequence>
      <element name="resourceName" type="string" />
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    <attribute name="name" type="string" />
  </complexType>
</element>
<element name="domainSourceHandle" type="string" />
<element name="domainDestinationHandle" type="string" />
<element name="applicationSourceHandle" type="string" />
<element name="applicationDestinationHandle" type="string" />
<element name="applicationDomainRelationshipName" type="string" />
<element name="applicationProfileID" type="string" />
<element name="processSourceHandle" type="string" />
<element name="processDestinationHandle" type="string" />
</schema>
```