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Enterprise-Control System Integration – Part 7: Alias Service Model

Approved 28 September 2017

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Enterprise-Control System Integration-Part 7: Alias Service Model

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ISA
67 T.W. Alexander Drive
P. O. Box 12277
Research Triangle Park, North Carolina 27709
USA

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ENTERPRISE-CONTROL SYSTEM INTEGRATION

Part 7: Alias Service Model

FOREWORD

ISA-95 is a series of standards that defines enterprise to control system integration. This standard, Part 7 in the series, defines an alias service model (ASM) that includes a set of services and exchange information used to map identifiers from one application's or system's identifier namespace to another application's or system's identifier namespace.

Clause 4 is normative. It defines the general service model and functions of the ASM services.

Clause 5 is normative. It defines the ASM object model.

Clause 6 is normative. It defines the ASM services.

Clause 7 is normative. It defines the ASM transactions.

Clause 8 is normative. It defines conformance points for compliance.

Annex A is normative. It provides property values.

Annex B is normative. It provides category names.

Annex C is informative. It provides example of use of the ASM.

Annex D is informative. It provides answers to frequently asked questions.

As currently envisioned, the ISA95 series consists of the following standards under the general title Enterprise-Control System Integration:

- Part 1: Models and terminology
- Part 2: Objects and attributes for enterprise-control system integration
- Part 3: Activity models of manufacturing operations management
- Part 4: Object models and attributes of manufacturing operations management
- Part 5: Business to manufacturing transactions
- Part 6: Messaging service model (MSM)
- Part 7: Alias service model (ASM)



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INTRODUCTION

This ISA-95 Part 7 standard is based on the use of ISA-95 object models defined in Parts 2, 4 and 5 (Parts 1 and 3 do not contain object models) to define a set of services that may be used to facilitate the mapping of identifiable elements between communicating applications. Applications may have, and often do have, different identifications for the same objects. In any exchange all parties to the exchange must agree on the names or identifiers of the objects. Often this agreement is managed through a set of alias identification registration services. This standard defines an alias service model (ASM) and formal object model for translating context in information exchanges. This standard defines a simple implementation approach to a subset of the much broader issue that is addressed by ISO/IEC 11179 Information technology – Metadata registries (MDR) and ISO/IEC 19763 Information technology – Metamodel framework for interoperability (MFI). This standard enables the use of existing ontology mapping standards (e.g., OWL / RDF. topic maps) as part of the contextualization of objects in the exchange and new standards as they are developed as part of the predicate definition between items. This standard provides for the exchange of the semantic mapping information as well as format information. The specific grammar and mechanisms used to express the context in these standards is not part of the scope of this standard.

All references to levels in this standard pertain to the levels of the function hierarchy model identified in the ISA-95 Part 1 standard.

This standard defines a set of services definitions that are designed to provide the functionality needed for a vendor independent method for translating identifiers across different namespaces. Using a common representation of objects, such as enumeration strings, property names, and equipment tag names, is an important element of any integrated system. Enterprise/Control system integration involves multiple different steps to exchange data between different computer system applications, as shown in Figure 1.

- a) The applications usually have different internal representations of exchanged objects in their own local data stores. In an exchange, this representation is converted from the local format to a commonly accepted global format. The ISA-95 Part 2 standard defines representations of a global format for Level 4-3 data exchanges. The Part 4 standard defines representations of a global format for Level 3-3 data exchanges.
- b) Any object identification and enumeration which needs to be exchanged and is not the same on all systems can be converted from a local namespace to a principle namespace (step 3 in the figure) and the principle namespace to the local namespace (step 7 in the figure). This standard defines a minimal set of services and message rules which can be used to translate local to principle and principle to local identifiers.

Example 1 Assume two applications, ALPHA and BETA, the ALPHA application initiates a data exchange with the BETA application, and BETA responds back to ALPHA. The format conversions are:

1. ALPHA's local format is converted to a global format for the request data.
2. Local items in ALPHA are mapped into a principle (global) items namespace.
3. The message is sent from ALPHA to BETA.
4. Upon receipt of the message, BETA must map the principle (global) items into BETA's item namespace.
5. The global format must be converted to BETA's local format for the request data.
6. If there is any response required, then the process is reversed.

Example 2 IDs for identified elements may be status codes, tag names, or equipment identifiers.

Example 3 Data which is represented in one element namespace, such as codes 1,2,3,4 may have a different namespace representation in another application, such as codes Ok, Done, Error, Delay.

- c) Messages are transported from one application to another, either within the same computer environment or across computers. Transport mechanisms are defined in other standards, such as TCP/IP and Ethernet standards. The Part 6 standard defines a set of message services for the exchange of messages between applications.
- d) When data exchange information is received, there are specific rules that define what resultant data is to be returned. The transaction rules are defined in the Part 5 standard (step 10 in the figure).

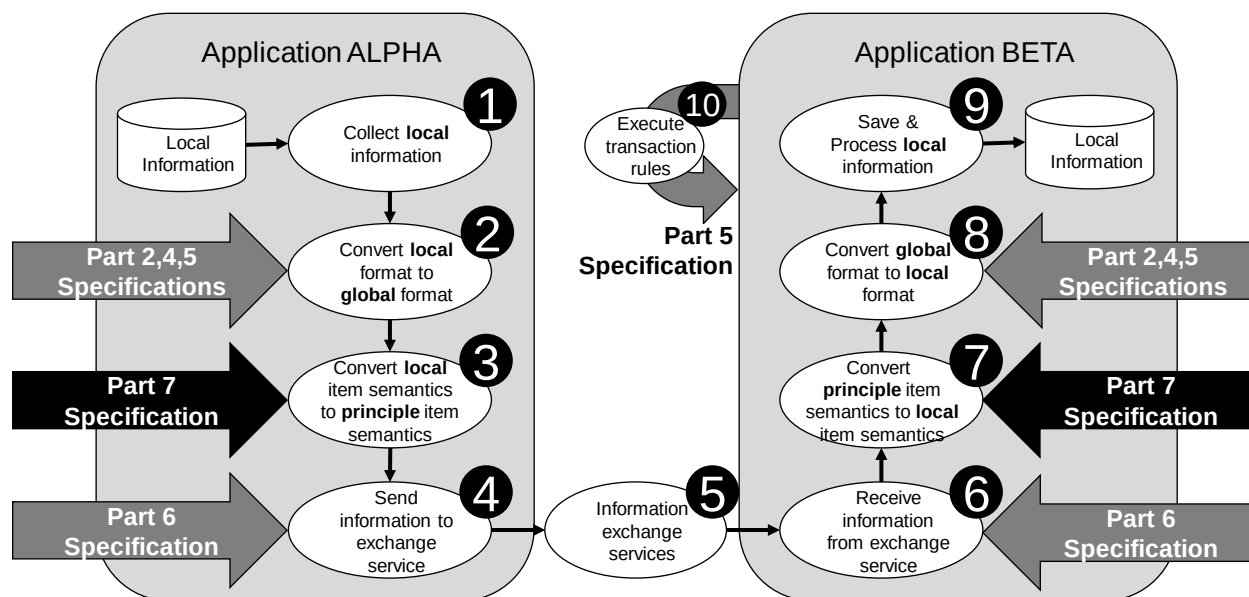


Figure 1 – Steps in application-to-application communication

This standard does not specify what technology an underlying system would use to implement the Alias services. Possible implementations include web services using a SOAP (Simple Object Access Protocol) interface, an HTTP/HTTPS implementation using a REST (Representational State Transfer) interface, or an API defined interface. This part defines the basic services with the assumption that specific technology implementations will be defined in companion specifications.

ENTERPRISE-CONTROL SYSTEM INTEGRATION

Part 7: Alias service model

1 Scope

This standard defines technology independent services and messages for associating and mapping aliases (equivalent identifiers) and associated context that are exchanged between manufacturing operations domain applications and applications in other domains. The identification of the organization and owner of each system and the lifecycle management of the equivalent object namespaces is outside the scope of this standard.

2 References

- [1] ANSI/ISA-95.00.01-2010 (IEC 62264-1 Mod), Enterprise-Control System Integration – Part 1: Models and Terminology
- [2] ANSI/ISA-95.00.02-2010 (IEC 62264-2 Mod), Enterprise-Control System Integration – Part 2: Object Models and Attributes
- [3] ANSI/ISA-95.00.04-2012, Enterprise-Control System Integration – Part 4: Object Models and Attributes of Manufacturing Operation Management
- [4] ANSI/ISA-95.00.05-2013, Enterprise-Control System Integration – Part 5: Business to Manufacturing Transactions
- [5] ANSI/ISA-95.00.06-2014, Enterprise-Control System Integration – Part 6: Message Service Model

3 Definitions, abbreviations, and conventions

3.1 Terms and definitions

3.1.1

alias

equivalent identifier

alternative ID for an object

3.1.2

alias directory

collection of equivalent identifications of objects

3.1.3

application

program or system that defines a namespace for IDs

NOTE: This defines the scope of where the ID namespace is defined. This may be a single instance of an application, multiple instances of the same application, applications using the same namespace from a single vendor, or a complete system that has applications from different vendors that have agreed to a common namespace.

3.1.4

category

organizational element used to group principle items and identifiers defined in namespaces

3.1.5

identifier

sequence of characters that uniquely identifies an object within a specific context

3.1.6**local identifier**

identifier of an object or enumeration for a specific namespace

3.1.7**namespace**

set of unique named identifiers for a specific application or system

3.1.8**namespace item**

unique ID that identifies an object or enumeration within a category for a specific namespace

3.1.9**principle item**

commonly agreed to identifier of an object or enumeration for exchange between different namespaces

3.2 Abbreviations

ASM Alias Service Model

ID Identifier

3.3 Conventions

Italics are used, beyond the use defined in ISO/IEC Directives Part 2, to emphasize the specific meaning of terms. They are used for the following cases:

- Names of objects used in exchanged data
- Names of services

4 Identifying objects and enumerations in data exchanges**4.1 Converting data element IDs**

Local IDs of data elements in an information exchange may not be globally known to all applications.

Example 1 Status values in one application may be defined as “**Good**” and “**Bad**”, but equivalent values may be defined as “**OK**” and “**NOK**” in another application or “**Pass**” and “**Fail**” in another application.

This standard defines a set of services that shall be used to provide an interface to a directory of equivalent IDs. It defines a common model for registration of identifiers and cross references of the identifiers for multiple systems. Different systems will often have different rules for the character sets available for use in identifiers and for the length of the identifiers.

Example 2 One system may allow A..Z, a..z, 0..9 in identifiers with a maximum length of 12, while another may also allow the use of the following characters “@/~\|_-.” with a maximum length of 32 characters.

NOTE 1 This standard does not define how the directory should operate. It only defines a standard set of services to use the directory, and message exchanges for using the directory.

NOTE 2 This standard does not specify what technology an underlying system would use to implement the services.

NOTE 3 This standard does not specify any local representation of the directory, but defines an abstract model for the exchange of directory information using object models in the same format as Parts 2 and 4, message transaction rules in the same format as Part 5 and a service model in the same format as Part 6.

4.2 Principle item

It is important for system integration startup and for error analysis in message exchanges to be able to easily interpret the content of messages. For this reason, the ASM has the concept of a principle item. Principle items should be defined as part of an engineering activity during an integration project. The services defined provide the support needed to perform the translations during message exchanges, and are not designed to provide creation or maintenance of a directory.

NOTE 1 The assumption is an ASM service provider would provide the methods to create, maintain, and manage the directory.

NOTE 2 Often the principle item is the identifier from the *system of record*. The *system of record* is the authoritative data source for a given data element or piece of information.

Example The following tables list examples of principle to local identifier translations:

Category ID	Principle ID	Alpha Namespace Item ID	Beta Namespace Item ID	Gamma Namespace Item ID
Material Status	Pass	Pass	réussir	pasar
Material Status	Fail	Fail	manquer	fallar

Category ID	Principle ID	Alpha Namespace Item ID	Beta Namespace Item ID	Gamma Namespace Item ID
Assembly Type	Physical Assembly	Physical Assembly	Physical	montaje físico
Assembly Type	Logical Assembly	Logical Assembly	Logical	montaje lógico

Category ID	Principle ID	Alpha Namespace Item ID	Beta Namespace Item ID	Gamma Namespace Item ID
Production Status	Approved	Available	Approved	aprobado
Production Status	Released	Ready	Released	liberado
Production Status	Blocked	Quarantined	Blocked	obstruido

Category ID	Principle ID	Alpha Namespace Item ID	Beta Namespace Item ID	Gamma Namespace Item ID
Tag Names	TIC-8106	Unit1.TopTemp	TIC-8106	TIC8106
Tag Names	LTC3_AIT211	AIT211	Lone Tree PLC Analyzer	LTC3_AIT211

4.3 Identifier categories

Category defines a collection of unique items within a collection of namespaces. Standard categories are defined in Annex B of this standard. Additional categories can be defined for property IDs, statuses, and other enumerations not defined in the other standards in the ISA-95 series.

4.4 Alias directory use

ASM provides a method for applications to convert local identifiers to common identifiers (principle IDs), and convert common identifiers to local identifiers as part of a complete application-to-application communication protocol. This is illustrated as step 7 in Figure 2.

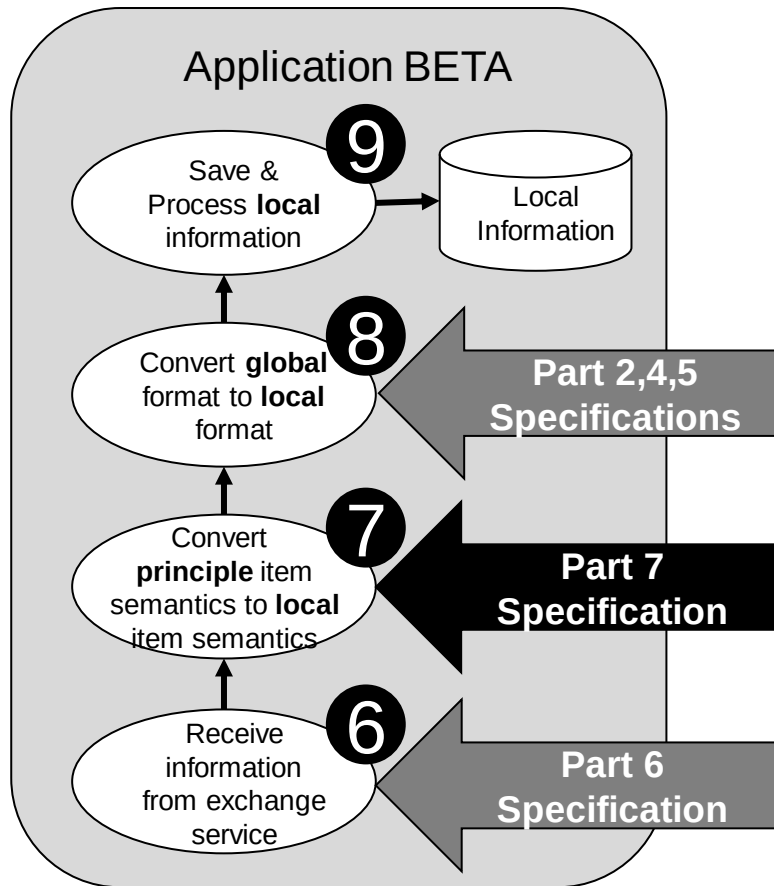


Figure 2 – Specifications in application-to-application communication

There are two models for translations, a set of standard services which translate lists of local to principle or principle to local identifiers, and a set of message transactions which can be used by an application to build a local cache of translated identifiers.

NOTE A local cache of translations can be used to reduce network communications and speed generation of exchange messages, but it does require that the ASM service provider supports the message exchange formats and that the application creating the cache also supports the message exchange formats.

4.5 Item predicate rules

Predicates define the rules that may have been used to convert local item semantics into principle item semantics, or that document the rules used in the conversions. This enables the use of existing ontology mapping standards (e.g., OWL / RDF Topic maps) as part of the contextualization of exchanged objects and new standards as they are developed. This allows for the exchange of the semantic mapping information and format information. The specific grammar and mechanisms used to express the context in these standards is not defined.

5 Alias directory object model

5.1 Alias directory model

A collection of categories containing object and enumeration identifications shall be presented as an *alias directory*. An *alias directory* shall be made up of *categories*, with *categories* made up of *namespaces*, with *namespaces* made up of *namespace items*, with *namespace items* optionally containing *namespace item properties*. Alias directory *categories* also contain a set of *principle items*. Principle items may optionally contain *principle item properties*.

Figure 3 is the *alias directory* model.

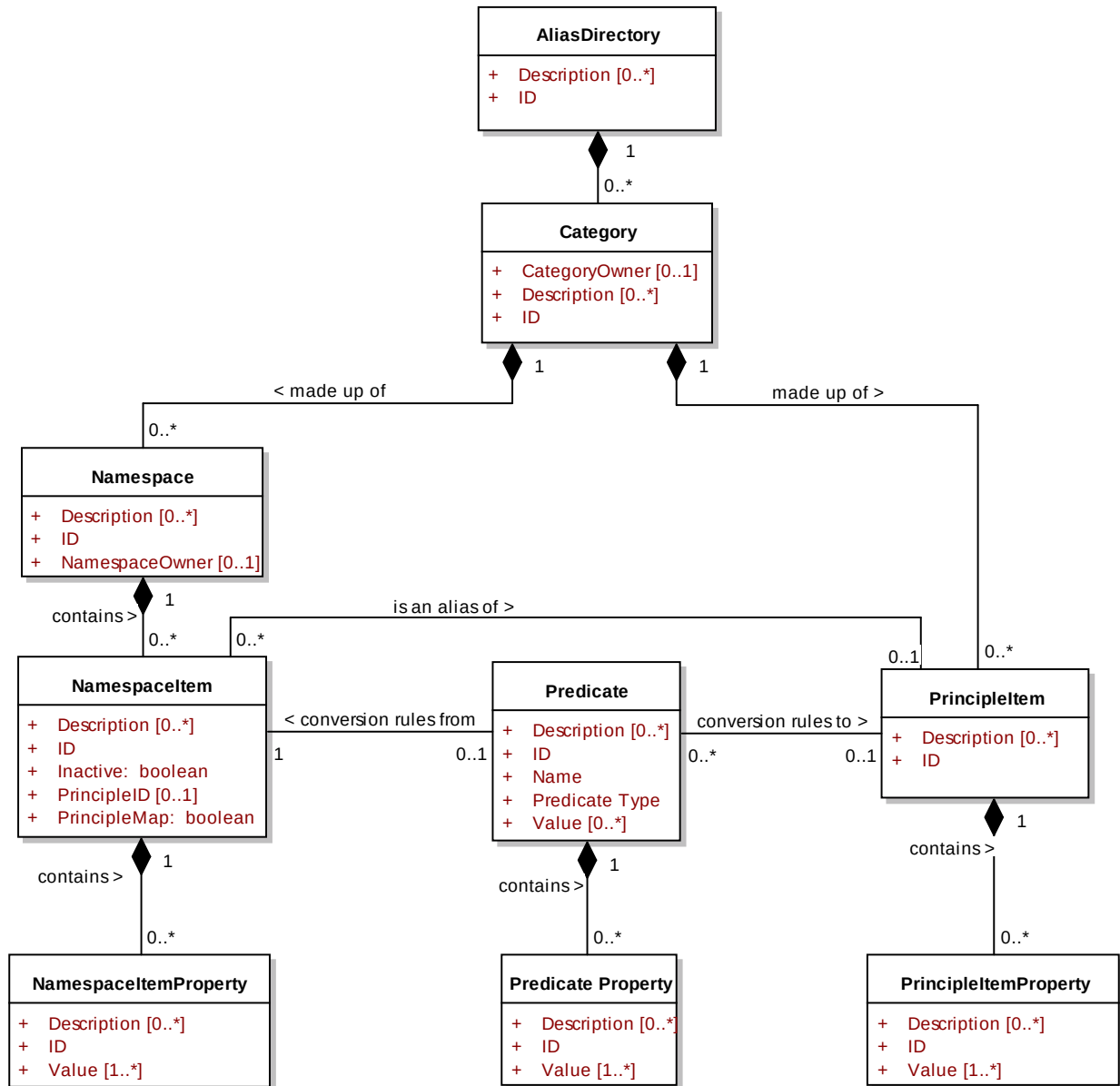


Figure 3 – Alias directory model

5.2 Alias directory elements

5.2.1 Alias directory

An *alias directory* object is the container object for a set of categories.

EXAMPLE Within a company, *alias directories* may be created for: testing, production use, local sites, global corporate information, areas, or departments.