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PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

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Enterprise-control system integration –
Part 6: Messaging Service Model

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FOREWORD

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IEC PAS 62264-6 has been processed by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
65E/476/PAS	65E/502/RVD

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

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INTRODUCTION

This PAS is based on the use of ISA-95 object models defined in ISA-95 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 exchange information messages. It is recognized that other, non-Part 6 sets of services are possible and are not deemed invalid as a result of this PAS. This PAS defines a Messaging Service Model (MSM) for exchanging data exchange messages in a publish/subscribe mode and a request/response mode. It defines a minimal interface subset to message exchange systems.

The Messaging Service Model provides a method for applications to send and receive messages from MSM service providers without regard to the underlying communication mechanism, as part of a complete application-to-application communication protocol.

This PAS defines a set of services definitions that are designed to provide the functionality needed for a vendor-independent method for sending and receiving data exchange messages on a message exchange system, such as an Enterprise Service Bus (ESB).

The knowledge requirements to interface to just one message exchange system can be immense, and are usually not transferable to a different system. MSM defines a single interface, independent of the underlying services, for Level 3-3 and Level 4-3 communications. This removes the need for vendors to build custom interface after custom interface, and for end users to get locked into a single vendor because their investment prevents them from reusing any of the integration efforts.

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. This representation is usually 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. This conversion, from local to global and global to local, is usually performed twice for any two-way communications.

   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: ALPHA's local format to global format for the request data, global format to BETA's local format for the request data, BETA's local format to global format for the response data, and global format to ALPHA's format for the response data.

b) Conversion is performed to align the namespaces among the exchanging applications, and is usually performed four times for any two-way communications.

   EXAMPLE 2 Names for elements of data may be codes, tag names, or equipment identifiers.

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

c) Once information is in the global format with appropriate global names, the exchanged information is sent from one application to another application.

d) 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.

e) When data exchange information is received, there are specific rules that define what resultant data are to be returned. The transaction rules are defined in the ISA-95 Part 5 standard.

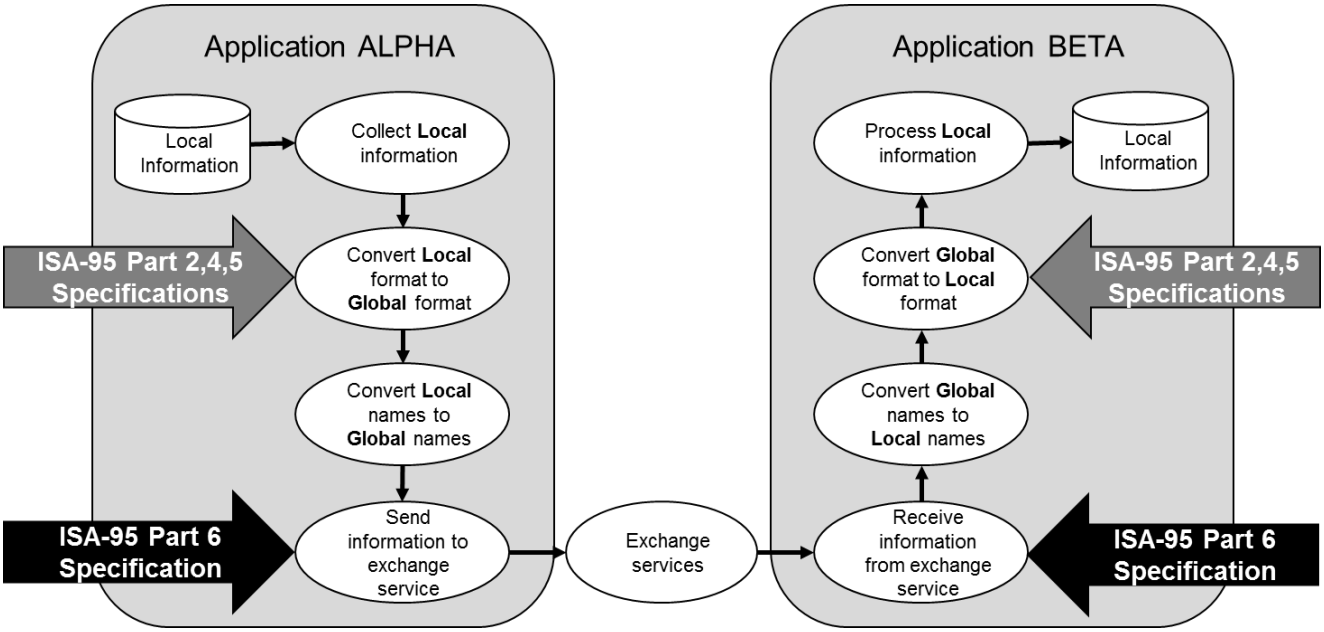

Figure 1 – Steps in application-to-application communication

ENTERPRISE-CONTROL SYSTEM INTEGRATION –

Part 6: Messaging Service Model

1 Scope

This part of IEC 62264, which is a PAS, defines a model of a set of messaging services for information exchanges across Levels 3 and 4, and within Level 3, between applications performing business and manufacturing activities. It defines a standard interface for information exchange between systems.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ANSI/ISA-95.00.01-2010 (IEC 62264-1 Mod), *Enterprise-Control System Integration – Part 1: Models and Terminology*

ANSI/ISA-95.00.02-2010 (IEC 62264-2 Mod), *Enterprise-Control System Integration – Part 2: Object Model Attributes*

ANSI/ISA-95.00.04-2012, *Enterprise-Control System Integration – Part 4: Objects and Attributes for Manufacturing Operations Management Integration*

ANSI/ISA-95.00.05-2013, *Enterprise-Control System Integration – Part 5: Business-to-Manufacturing Transactions*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
channel description
text that describes a channel

3.1.2
channel type
primary use of a channel for publications or requests

3.1.3
channel URI
primary identifier for a channel

3.1.4
filter expression
filtering element that may be applied to messages on a channel

3.1.5
listener identification
implementation defined element that is used to indicate to an application when a new message has arrived

3.1.6
message content
body of the message

3.1.7
message expiry
duration until the expiration of a publication message on a publication channel

3.1.8
message ID
identifier generated upon posting of a message to a channel in a session

3.1.9
namespace
collection of names or words that define a formal and distinct set

3.1.10
security token
physical device or software code used to gain access to a channel

3.1.11
session ID
identifier generated upon an application creating a session on a channel and provided to the application for use in the MSM services

3.1.12
topic
identification of the information content in a message

3.2 Abbreviations

B2MML	Business to Manufacturing Markup Language
CB (radio)	Citizens' Band radio
CCOM-ML	Common Conceptual Object Model – Markup Language
ERP	Enterprise Resource Planning
ESB	Enterprise Service Bus
FTP	File Transfer Protocol
HTTP	Hypertext Transmission Protocol
JMS	Java Message Service
MSM	Messaging Service Model
MIMOSA	An Operations and Maintenance Information Open System Alliance
OAG	Open Applications Group
OAGIS	Open Applications Group Integration Specification
OMAC	The Organization for Machine Automation and Control
OpenO&M	Open Operations and Maintenance Group

OPC-UA	OPC-Unified Architecture
REST	Representational State Transfer
RSS	Really Simple Syndication
SOAP	Simple Object Access Protocol
TCP/IP	Transmission Control Protocol / Internet Protocol
UDDI	Universal Description, Discovery and Integration
URI	Universal Resource Identifier
WS_*	World Wide Web Service standards
XML	Extensible Markup Language
XSLT	Extensible Stylesheet Language Transformations

3.3 Conventions

Input and returned parameters defined in Clause 6 are required unless they are explicitly defined as optional.

4 The Messaging Service Model

4.1 Interface model

The MSM defines a standard set of services that shall be provided by an application or network service. The services provide a method for multiple applications to communicate using the transaction models defined in the ISA-95.00.05 and IEC 62264-5 standards. The MSM:

– does not define how the services are implemented,

– does not define the architecture of the supporting application or network service,

– does not define any specific underlying communication method.

The MSM provides a standard interface to an Enterprise Service Bus (ESB) system[1] or to any other message or file exchange system that offers guaranteed message delivery, message sequencing, and storage or caching of exchanged messages.

NOTE 1 Multiple different implementations are envisioned, such as a service using OPC UA, a service using FTP, or a service using an ESB.

NOTE 2 The MSM service will have to include some method for storage or caching of exchanged information, and some method of guaranteed message delivery.

The level of services not defined in this PAS, for example the type of security, reliability, guaranteed delivery, quality of service, transformation capability, and other features would be provided by the MSM Service Provider and provide differentiation between suppliers and solutions.

4.2 Application to application data exchange

Application to application data exchange is represented in communication models as a single “Application” layer. However, with the development of data object standards (such as ISA-95 models), data representation messages (such as B2MML, MIMOSA CCOM-ML and OAGIS Nouns), and transaction messages (such as IEC 62264-5 and OAGIS 9.0 Verbs), means that a simple single layer is insufficient to describe the complexity of object based application-to-application transactional communication.

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1 See Annex B for a brief discussion on Enterprise Service Buses.

Two additional elements can be defined for application-to-application communication: a data object definition and transaction message definition which communicate to the application layer and the underlying exchange services, as shown in Figure 2.

MSM is a minimal interface subset that can reside on most exchange services and is based on well-defined and structured data objects and transaction messages.

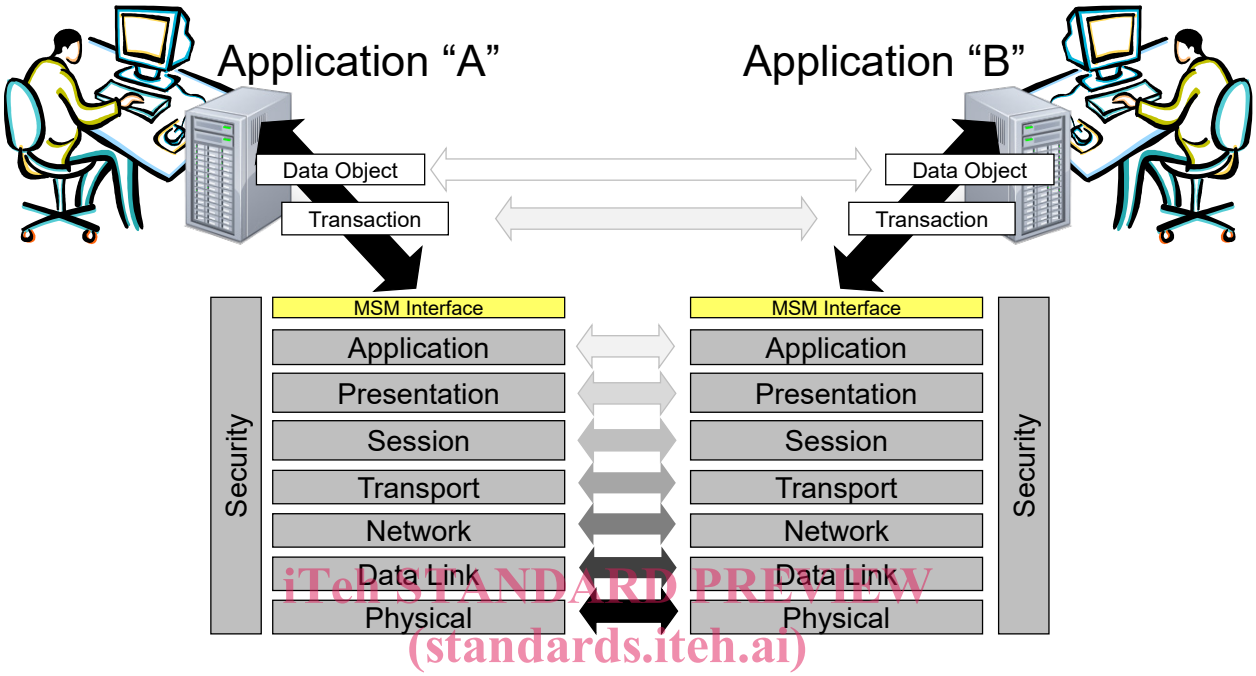

Figure 2 – Application communication stack

Each of these layers addresses a specific element of application data exchange, as shown in Figure 3:

a) A Data Object layer defines the meaning, format, and structure of the basic elements of exchanged information.

NOTE 1 This layer uses application space specific definitions, such as the ISA-95.02 object definitions, MESA B2MML, MIMOSA CCOM-ML objects, and “Nouns” defined in OAGIS.

b) A Transaction layer defines the meaning, format, and structure of actions to be taken on the data objects.

NOTE 2 This layer can use IEC 62264-5 transaction style specific definitions. Another transaction layer definition could be the OAGIS “Verb” definitions.

c) The MSM Service Interface defines a minimal interface to the Application layer’s Exchange Services.

d) The application, presentation, session and lower level layers define the meaning, format, and structure for coordination, buffering, and exchange of messages or files. These layers contain transfer or exchange style specific definitions, such as Enterprise Service Buses, Enterprise Message Delivery Systems, the OPC-UA specification (IEC 62541 (all parts)), RSS, FTP, Named Pipes, Ethernet, TCP/IP, HTTP, and others.