IEC 62769-5

Edition 1.0 2015-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Field Device Integration (FDI) –
Part 5: FDI Information Model

Intégration des appareils de terrain (FDI) –
Partie 5: Modèle d'Information FDI

IEC 62769-5:2015-05en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE INTEGRATION (FDI) –

Part 5: FDI Information Model

FOREWORD

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International Standard IEC 62769-5 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this standard is based on the following documents:

CDV	Report on voting
65E/348/CDV	65E/425/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62769 series, published under the general title *Field Device Integration (FDI)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning

a) Method for the Supplying and Installation of Device-Specific Functionalities, see Patent Family DE10357276;

b) Method and device for accessing a functional module of automation system, see Patent Family EP2182418;

c) Methods and apparatus to reduce memory requirements for process control system software applications, see Patent Family US2013232186;

d) Extensible Device Object Model, see Patent Family US12/893,680.

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FIELD DEVICE INTEGRATION (FDI) –

Part 5: FDI Information Model

1 Scope

This part of IEC 62769 defines the FDI Information Model. One of the main tasks of the Information Model is to reflect the topology of the automation system. Therefore it represents the devices of the automation system as well as the connecting communication networks including their properties, relationships, and the operations that can be performed on them. The types in the AddressSpace of the FDI Server constitute some kind of catalogue, which is built from FDI Packages.

The fundamental types for the FDI Information Model are well defined in OPC UA for Devices (IEC 62541-100). The FDI Information Model specifies extensions for a few special cases and otherwise explains how these types are used and how the contents are built from elements of DevicePackages.

The overall FDI architecture is illustrated in Figure 1. The architectural components that are within the scope of this document have been highlighted in this illustration.

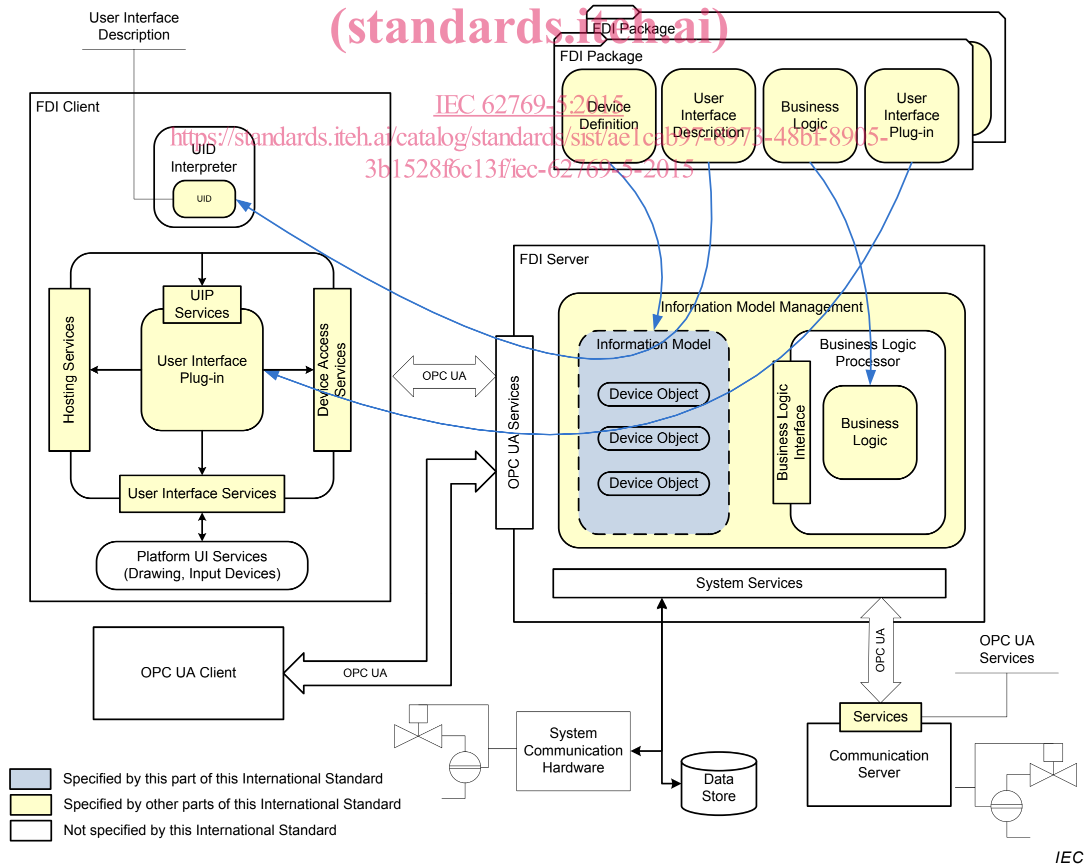

Figure 1 – FDI architecture diagram

2 Normative references

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

IEC 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

IEC 61804-3[1], *Function blocks (FB) for process control and Electronic Device Description Language (EDDL) – Part 3: EDDL syntax and semantics*

IEC 62541-3, *OPC unified architecture – Part 3: Address Space* Model

IEC 62541-4, *OPC unified architecture – Part 4: Services*

IEC 62541-5, *OPC unified architecture – Part 5: Information Model*

IEC 62541-6, *OPC unified architecture – Part 6: Mappings*

IEC 62541-8, *OPC unified architecture – Part 8: Data Access*

IEC 62541-100[2], *OPC unified architecture – Part 100: OPC UA for Devices*

IEC 62769-1, *Field Device Integration (FDI) – Part 1: Overview*

NOTE IEC 62769-1 is technically identical to FDI-2021

IEC 62769-2, *Field Device Integration (FDI) – Part 2: FDI Client*

NOTE IEC 62769-2 is technically identical to FDI-2022

IEC 62769-4, *Field Device Integration (FDI) – Part 4: FDI Packages*

NOTE IEC 62769-4 is technically identical to FDI-2024

IEC 62769-7, *Field Device Integration (FDI) – Part 7: FDI Communication Devices*

NOTE IEC 62769-7 is technically identical to FDI-2027

3 Terms, definitions, abbreviated terms, acronyms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62769-1 apply.

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1 To be published.

2 Under consideration.

3.2 Abbreviated terms and acronyms

For the purposes of this document, the abbreviated terms and acronyms given in IEC 62769-1 as well as the following apply.

HMI	Human Machine Interface
SCADA	Supervisory Control and Data Acquisition
TCP	Transmission Control Protocol

3.3 Conventions for graphical notation

OPC UA defines a graphical notation for an OPC UA AddressSpace. It defines graphical symbols for all NodeClasses and how different types of References between Nodes can be visualized. Figure 2 shows the symbols for the NodeClasses used in this standard. NodeClasses representing types always have a shadow.

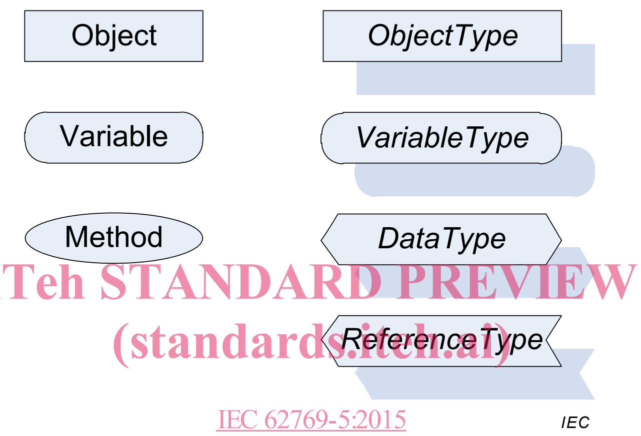

Figure 2 – OPC UA Graphical Notation for NodeClasses

Figure 3 shows the symbols for the ReferenceTypes used in this standard. The Reference symbol is normally pointing from the source Node to the target Node. The only exception is the HasSubType Reference. The most important References such as HasComponent, HasProperty, HasTypeDefinition and HasSubType have special symbols avoiding the name of the Reference. For other ReferenceTypes or derived ReferenceTypes the name of the ReferenceType is used together with the symbol.

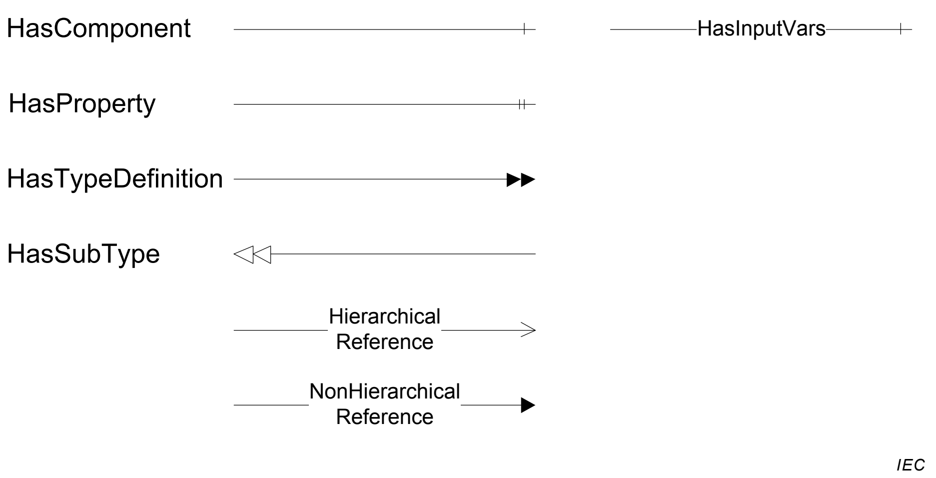

Figure 3 – OPC UA Graphical Notation for References

Figure 4 shows a typical example for the use of the graphical notation. Object_A and Object_B are instances of the ObjectType_Y indicated by the HasTypeDefinition References. The ObjectType_Y is derived from ObjectType_X indicated by the HasSubType Reference. The Object_A has the components Variable_1, Variable_2 and Method_1.

To describe the components of an Object on the ObjectType the same NodeClasses and References are used on the Object and on the ObjectType such as for ObjectType_Y in the example. The Nodes used to describe an ObjectType are instance declaration Nodes.

To provide more detailed information for a Node, a subset or all Attributes and their values can be added to a graphical symbol (see for example Variable_1, the component of Object_A in Figure 4).

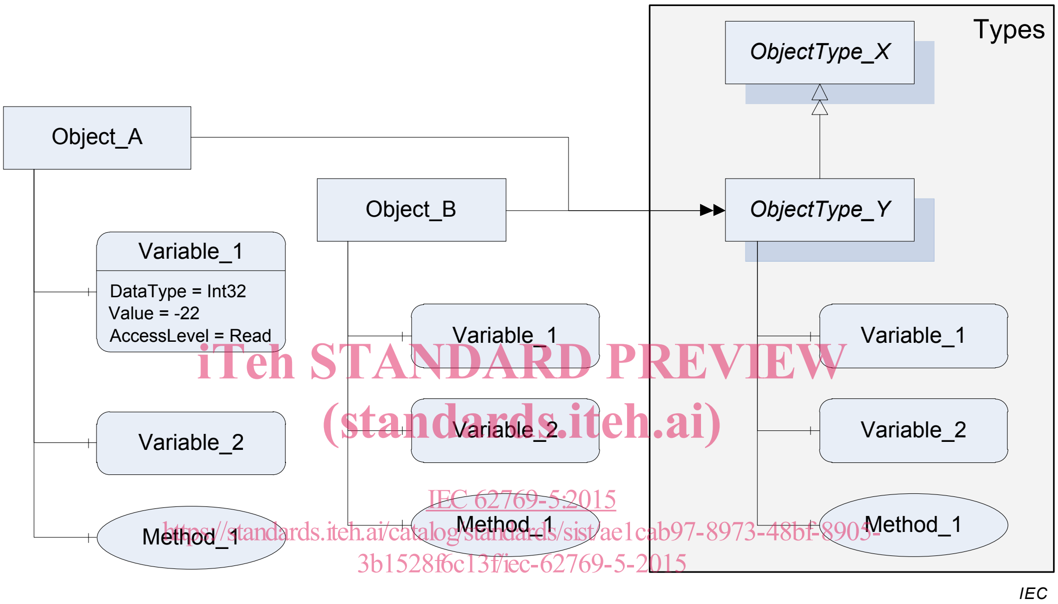

Figure 4 – OPC UA Graphical Notation Example

To improve readability, this document frequently includes the type name inside the instance box rather than displaying both boxes and a reference between them. This optimization is shown in Figure 5.

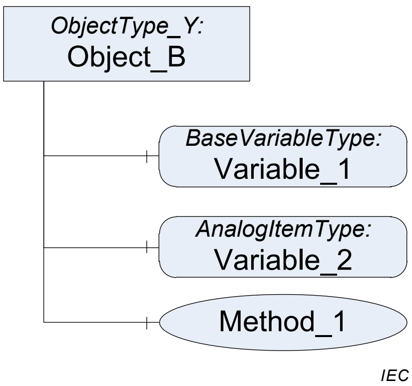

Figure 5 – Optimized Type Reference

4 Overview of OPC Unified Architecture

4.1 General

The main use case for OPC standards is the online data exchange between devices and HMI or SCADA systems. In this use case the device data is provided by an OPC server and is consumed by an OPC client integrated into the HMI or SCADA system. OPC provides functionality to browse through a hierarchical namespace containing data items and to read, write and monitor these items for data changes.

OPC UA incorporates features like Data Access, Alarms and Historical Data via platform independent communication mechanisms and generic, extensible and object-oriented modelling capabilities for the information a system wants to expose.

The current version of OPC UA defines an optimized binary TCP protocol for high performance intranet communication as well as a mapping to Web Services. The abstract service model does not depend on a specific protocol mapping and allows adding new protocols in the future. Features like security, access control and reliability are directly built into the transport mechanisms. Based on the platform independence of the protocols, OPC UA servers and clients can be directly integrated into devices and controllers.

The OPC UA information model provides a standard way for Servers to expose Objects to Clients. Objects in OPC UA terms are composed of other Objects, Variables and Methods. OPC UA also allows relationships to other Objects to be expressed.

The set of Objects and related information that an OPC UA Server makes available to Clients is referred to as its AddressSpace. The elements of the OPC UA Object Model are represented in the AddressSpace as a set of Nodes described by Attributes and interconnected by References. OPC UA defines various classes of Nodes to represent AddressSpace components, most importantly Objects, Variables, Methods, ObjectTypes, DataTypes and ReferenceTypes. Each NodeClass has a defined set of Attributes.

Objects are used to represent components like folders, Devices or Networks. An Object is associated to a corresponding ObjectType that provides definitions for that Object.

Variables are used to represent values. Two categories of Variables are defined, Properties and DataVariables.

Properties are Server-defined characteristics of Objects, DataVariables and other Nodes. Properties are not allowed to have Properties defined for them. An example for Properties of Objects is the Manufacturer Property of a Device.

DataVariables represent the contents of an Object. DataVariables may have component DataVariables. This is typically used by Servers to expose individual elements of arrays and structures. This standard uses DataVariables mainly to represent the Parameters of Devices.

4.2 Overview of OPC UA Devices

The OPC Unified Architecture for Devices (DI) (IEC 62541-100) standard is an extension of the overall OPC Unified Architecture standard series and defines information models associated with Devices. IEC 62541-100 describes three models which build upon each other as follows:

- The (base) Device Model is intended to provide a unified view of devices irrespective of the underlying device protocols.
- The Device Communication Model adds Network and Connection information elements so that communication topologies can be created.