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Field device integration (FDI) –
Part 6: **FDI** Technology Mapping

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INTERNATIONAL STANDARD



Field device integration (FDI) –
Part 6: **FDI** Technology Mapping

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FIELD DEVICE INTEGRATION (FDI) –

Part 6: ~~FDI~~ Technology Mapping

FOREWORD

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International Standard IEC 62769-6 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) redesign of the security concept for UIP execution.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65E/763/FDIS	65E/773/RVD

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

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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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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The IEC 62769 series has the general title *Field Device Integration (FDI)* and the following parts:

- Part 1: Overview
- Part 2: FDI Client
- Part 3: FDI Server
- Part 4: FDI Packages
- Part 5: FDI Information Model
- Part 6: FDI Technology Mapping
- Part 7: FDI Communication Devices

- Part 100: Profiles – Generic Protocol Extensions
- Part 101-1: Profiles – Foundation Fieldbus H1
- Part 101-2: Profiles – Foundation Fieldbus HSE
- Part 103-1: Profiles – PROFIBUS
- Part 103-4: Profiles – PROFINET
- Part 109-1: Profiles – HART and WirelessHART
- Part 115-2: Profiles – Protocol-specific Definitions for Modbus RTU
- Part 150-1: Profiles – ISA 100.11a

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FIELD DEVICE INTEGRATION (FDI) –

Part 6: ~~FDI~~ Technology Mapping

1 Scope

This part of IEC 62769 specifies the technology mapping for the concepts described in the Field Device Integration (FDI) standard. The technology mapping focuses on implementation regarding the components FDI Client and User Interface Plug-in (UIP) that are specific only to the WORKSTATION platform/.NET as defined in IEC 62769-4:2015, Annex E.

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 61804 (all parts), *Function blocks (FB) for process control and Electronic Device Description Language (EDDL)*

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

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

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

IEC 62541 (all parts), *OPC Unified Architecture*

~~IEC 61804 (all parts), *Function blocks (FB) for process control*~~

~~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 1 – IEC 62769-2 is technically identical to FDI-2022.~~

~~NOTE 2 – IEC 62769-2 is technically identical to FDI-2023.~~

~~IEC 62769-4:2015, *Field Device Integration (FDI) – Part 4: FDI Packages*~~

~~NOTE – IEC 62769-4 is technically identical to FDI-2024.~~

~~IEC 62769-5, *Field Device Integration (FDI) – Part 5: FDI Information Model*~~

~~NOTE 1 – IEC 62769-5 is technically identical to FDI-2025.~~

~~NOTE 2 – IEC 62769-5 is technically identical to FDI-2027.~~

ISO/IEC 19505-1, *Information technology – Object Management Group Unified Modeling Language (OMG UML) – Part 1: Infrastructure*

ISO/IEC 29500, (all parts) *Information technology – Document description and processing languages – Office Open XML File Formats*

3 Terms, definitions, abbreviated terms, ~~acronyms~~ symbols and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62769-1 as well as the following 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

Application Domain

isolated environment where applications execute

3.1.2

Assembly

~~reusable, version information providing, and self-describing building block of a CLR application~~

~~Note 1 to entry: This note applies to the French language only.~~

3.1.2

FDI Type Library

assembly that contains the interfaces and data types that are used for the data exchange and interaction between a UIP and an FDI Client

~~Note 1 to entry: This note applies to the French language only.~~

~~Note 2 to entry: This note applies to the French language only.~~

3.1.3

Global Assembly Cache

machine-wide code cache that stores Assemblies specifically designated to be shared by several applications

3.1.4

Windows Registry

system-defined database in which applications and system components store and retrieve configuration data

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.

CLR	Common Language Run-time
MSI	Microsoft Installer
WPF	Windows Presentation Foundation
UML	Unified Modeling Language

3.3 Symbols

Figures in this document use graphical symbols in accordance with ISO/IEC 19505-1 (UML 2.0).

3.4 Conventions

For the purposes of this document, the conventions given in IEC 62769-1 apply.

The description of Non-blocking service execution in 4.8.2 uses italics to identify a generic operation name the internal function is being applied to.

4 Technical concepts

4.1 General

4.1.1 Overview

In 4.1.2, 4.2, 4.3, 4.4, and 4.5, this document describes first the technology base for UIP implementation, the hardware and software environment including the related implementation rules. Clause 4 follows a life-cycle (use case) oriented approach.

Subclause 4.6 describes the copy deployment procedures and related implementation rules for the UIP and the FDI Client. UIP executable instantiation and termination is described in 4.7. Subclause 4.8 defines the rules about interaction between the FDI Client and the UIP. Security related definitions are written in 4.9. The service interface definitions for the FDI Client and the UIP are found in Clause 5.

4.1.2 Platforms

The UIP and FDI Client shall be built upon the Microsoft .NET Framework and executed in the .NET Common Language Run-time.

The minimum set of workstation-supported I/O devices is: mouse, keyboard, and color screen resolution of 1024 × 768 pixels.

The following Table 1 lists all the technologies and their editions that are consistent with FDI components.

Table 1 – Technology edition reference

Technology	Standard	Edition
.NET	N/A	CLR4 for UIP Implementation
EDDL	IEC 61804	2014/2016
OPC UA (Parts 1-8)	IEC 62541	2015 (to be published)
Open Packaging Convention	ISO/IEC 29500	2014/2016
Extensible Markup Language (XML)	N/A	W3C, 1.0 (fifth edition)

4.1.3 FDI Type Library

The Device Access Services and the UIP Services can be modelled as .NET interfaces passing .NET data type arguments. These interfaces and data types are used for the data exchange and interaction between the UIP and the FDI Client. For runtime error handling purposes during interface method calls, .NET exceptions classes are defined.

~~The FDI .NET interfaces, data types, and exception classes are defined in a single FDI Type Library. The FDI Type Library is a strong named Assembly. The FDI Type Library is signed with a single unique key. The FDI Type Library shall be installed as part of the FDI Client installation and not with a UIP.~~

~~FDI Type Libraries shall not be registered within the Global Assembly Cache.~~

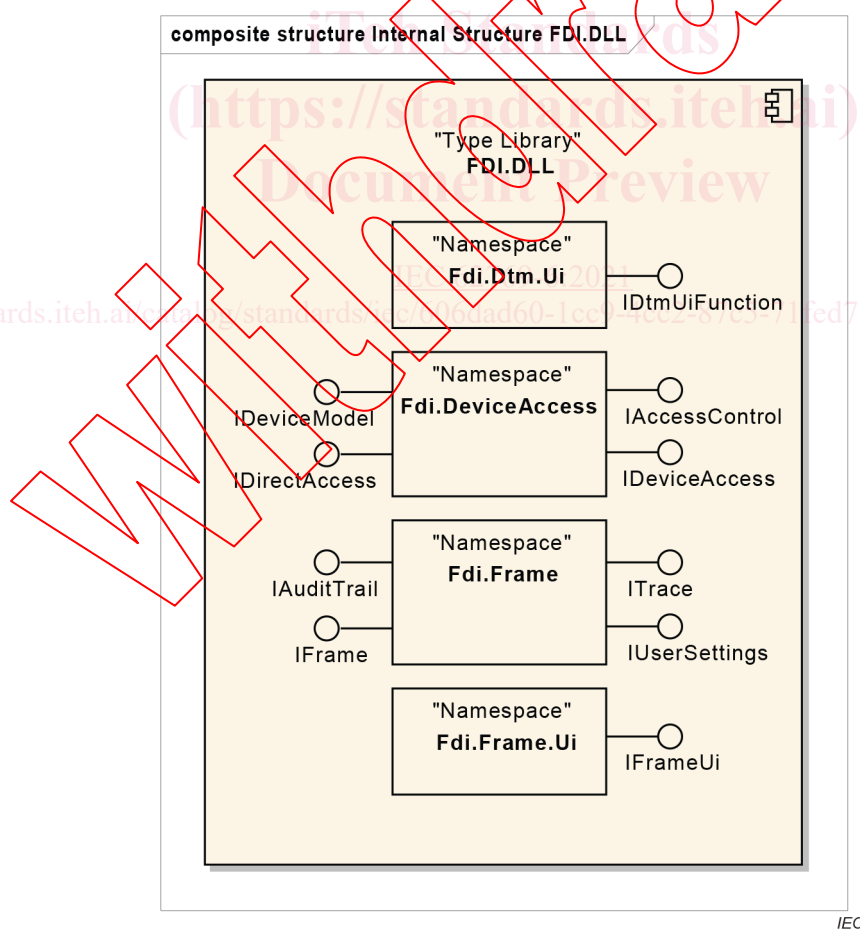
~~The FDI Client shall install FDI Library Versions for all Technology Versions that it supports.~~

~~The FDI Type Library shall be installed in such way that it is shared between the UIP and the FDI Client.~~

The FDI .NET interfaces, data types, and exception classes are defined in a single FDI Type Library. The FDI Type Library is a strong-named Assembly. The file name of this Assembly shall be 'fdi.dll'. The fdi.dll shall be versioned as per IEC 62769-1:2020, 8.1. The FDI Type Library is part of the FDI Core Technology as per IEC 62769-1:2020, 8.3.2.1 and therefore directly influences the FDI Technology Version. All Compatible changes of the fdi.dll lead to an increase of the minor portion of the FDI Technology Version. Incompatible changes lead to an increase of the major portion of the FDI Technology Version (see IEC 62769-1:2020, 8.3.2.2).

The FDI Type Library is signed with a single unique key by the issuer of the file. The FDI Type Library shall be installed separately as part of every FDI Client installation. User Interface Plug-Ins (UIP) and the FDI Client Application shall use this instance of the fdi.dll. UIPs shall not carry or deploy the FDI Type Library. The FDI Client is responsible to provide means to allow updates of this type library over time.

Figure 1 shows the FDI Type Library structure.



NOTE The composite structure diagram shows only the core interfaces that implement the interfaces defined in IEC 62769-2.

Figure 1 – FDI Type Library structure

4.2 UIP representation

The UIP Variant can contain either a single or multiple runtime modules (.NET Assembly) and their related supplementary files (for example: resource files). The runtime module of the UIP Variant is called "UIP executable". The supplementary file(s) of the UIP Variant is/are called "UIP supplement(s)".

UIP supplement(s) is/are stored under (a) subfolder(s) of the UIP executable installation directory.

EXAMPLE ~~Examples of UIP supplementary data files include~~ Resource files and application configuration data.

The RuntimeId of a UIP Variant shall be ".NET Framework CLR4", see IEC 62769-4. FDI Clients supporting this RuntimeId shall support the .NET Framework 4.6.1 or higher using the CLR4 and UIPs with this RuntimeId shall use the .NET Framework 4.6.1 or lower supporting the CLR4 (meaning .NET Framework 4.0 up to .NET Framework 4.6.1).

The UIP Variant shall be self-contained. All UIP required libraries (.NET Assemblies) required by a UIP Variant are stored within the same Folder.

4.3 UIP executable representation

The implementation of the UIP depends on the type of user interface elements that can be embedded into the user interface hosting environment of the FDI Client. UIP shall be implemented as a .NET System.Windows.Forms class UserControl or a Windows Presentation Foundation (WPF) System.Windows.Controls class UserControl.

UIP executables and their required libraries shall have strong names. The signing of a strong-named Assembly can be done using a self-generated key.

NOTE The identity of strong-named Assemblies consists of a name, version, culture, public key token and digital signature.

UIP executables and their required libraries shall be shipped with file containing the public key in order to enable Assembly verification.

4.4 UIP executable compatibility rules

~~The UIP component provided version information consists of:~~

~~<Major>.<Minor>.<Build Number>.<Revision>~~

~~UIP components using the same identity (UipId/IEC 62769-5) that are showing a different value in position <Major> are not compatible with each other. Any other difference showed in the version information between the same UIP component identities means that those UIP component identities are compatible. A newer UIP component is allowed to overwrite an older UIP component without breaking the intended functionality.~~

The compatibility rules for different versions of the UIP component are specified in IEC 62769-4.

The compilation target platform for the UIP shall be "anyCPU". If this is not feasible, the UIP shall be shipped in two variants. One UIP variant shall be compiled for target platform "x86". The second UIP variant shall be compiled for target platform "x64". The compilation platform target shall be described in the catalog.xml file, which is defined in IEC 62769-4. This catalog.xml file contains an xml element "CpuInformation" that describes the User Interface Plug-in variant. The allowed values that shall be used in the xml element "CpuInformation" are "anyCPU", "x86" or "x64".