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Siehe Anwendungsbeginn

Feldgeräteintegration (FDI) – Teil 3: FDI-Server (IEC 62769-3:2021); Englische Fassung EN IEC 62769-3:2021

Field Device Integration (FDI) –
Part 3: Server
(IEC 62769-3:2021);
English version EN IEC 62769-3:2021

Intégration des appareils de terrain (FDI) –
Partie 3: Serveur
(IEC 62769-3:2021);
Version anglaise EN IEC 62769-3:2021

Gesamtumfang 64 Seiten

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Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2021-03-12 angenommene Europäische Norm als DIN-Norm ist 2022-09-01.

Für DIN EN 62769-3:2016-03 besteht eine Übergangsfrist bis 2024-03-12.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 62769-3:2019-05.

Für dieses Dokument ist das nationale Arbeitsgremium DKE/K 956 „Industrielle Kommunikation“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

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Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN IEC 62769-3 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt und Abschnitt 3, der die Begriffe, Abkürzungen und Konventionen festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

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Änderungen

Gegenüber DIN EN 62769-3:2016-03 wurden folgende Änderungen vorgenommen:

a) Änderung des Konzepts für den Bearbeitungskontext zur Harmonisierung der Normenreihen IEC 61804 und IEC 62769.

Frühere Ausgaben

DIN EN 62769-3: 2016-03

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Nationaler Anhang NA
(informativ)

Auszugsweise Übersetzung

Reihenfolge und Inhalt der folgenden Abschnitte sind identisch mit denen in den jeweiligen Abschnitten der Englischen Fassung.

1 Anwendungsbereich

Dieser Teil von IEC 62769 legt den FDI-Server fest. Die gesamtheitliche FDI-Architektur ist in Bild 1 dargestellt. Die im Anwendungsbereich dieses Dokuments liegenden Architekturkomponenten sind in diesem Bild hervorgehoben.

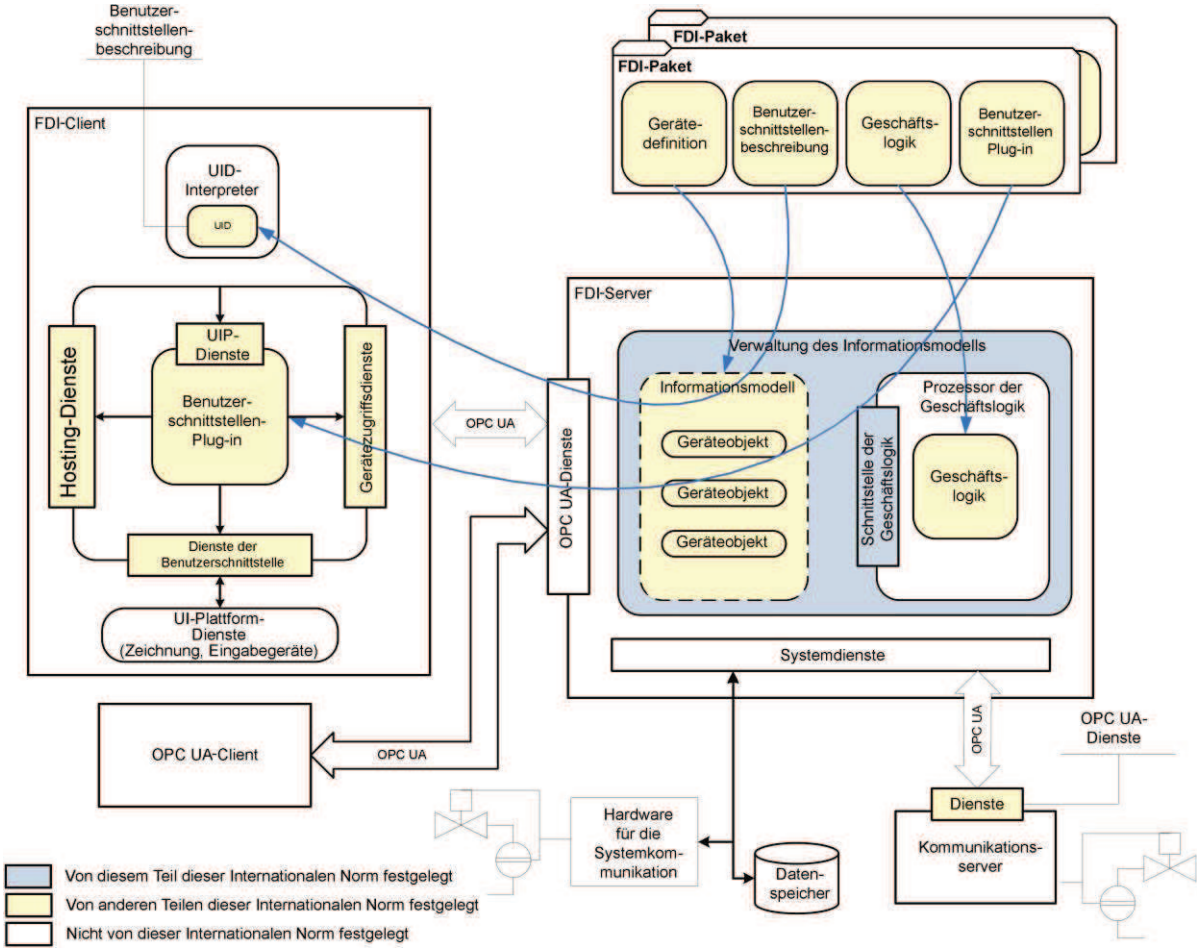

Bild 1 – FDI-Architektur

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3 Begriffe, Abkürzungen und Konventionen

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC 62769-1 und die folgenden Begriffe.

ISO und IEC stellen terminologische Datenbanken für die Anwendung in der Normung unter den folgenden Adressen bereit:

- IEC Electropedia: verfügbar unter http://www.electropedia.org/
- ISO Online Browsing Platform: verfügbar unter http://www.iso.org/obp

3.1 Begriffe

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC 62769-1 und die folgenden Begriffe.

3.1.1
Aktionsproxy
en **Actions Proxy**
interne Einheit des FDI-Servers, die alle EDD-Methoden zusammenfasst, welche in einer Definition der EDD-Aktion festgelegt sind

3.2 Abkürzungen

Für die Anwendung dieses Dokuments gelten die Abkürzungen nach IEC 62769-1.

3.3 Konventionen

Für die Anwendung dieses Dokuments gelten die Konventionen nach IEC 62769-1.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 62769-3

March 2021

ICS 25.040.40; 35.100.05

Supersedes EN 62769-3:2015 and all of its amendments and corrigenda (if any)

English version

Field Device Integration (FDI) – Part 3: Server
(IEC 62769-3:2021)

Intégration des appareils de terrain (FDI) – Partie 3: Serveur
(IEC 62769-3:2021)

Feldgeräteintegration (FDI) – Teil 3: FDI-Server
(IEC 62769-3:2021)

This European Standard was approved by CENELEC on 2021-03-12. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 65E/760/FDIS, future edition 2 of IEC 62769-3, prepared by SC 65E "Devices and integration in enterprise systems" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62769-3:2021.

The following dates are fixed:

– latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop):	2021-12-12
– latest date by which the national standards conflicting with the document have to be withdrawn	(dow):	2024-03-12

This document supersedes EN 62769-3:2015 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62769-3:2021 was approved by CENELEC as a European Standard without any modification.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 61804	series	Function blocks (FB) for process control and electronic device description language (EDDL)	EN IEC 61804	series
IEC 61804-4	2020	Devices and integration in enterprise systems - Function blocks (FB) for process control and electronic device description language (EDDL) - Part 4: EDD interpretation	EN IEC 61804-4	2020
IEC 62541-4	-	OPC Unified Architecture - Part 4: Services	EN IEC 62541-4	-
IEC 62541-7	-	OPC unified architecture - Part 7: Profiles	EN IEC 62541-7	-
IEC 62769-1	-	Field Device Integration (FDI) - Part 1: Overview	EN 62769-1	-
IEC 62769-2	-	Field Device Integration (FDI) - Part 2: FDI Client	EN 62769-2	-
IEC 62769-4	-	Field Device Integration (FDI) - Part 4: FDI Packages	EN 62769-4	-
IEC 62769-5	-	Field Device Integration (FDI) - Part 5: Information Model	EN 62769-5	-
IEC 62769-7	-	Field Device Integration (FDI) - Part 7: Communication Devices	EN 62769-7	-

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INTRODUCTION

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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1 Scope

This part of IEC 62769 specifies the FDI Server. 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 figure.

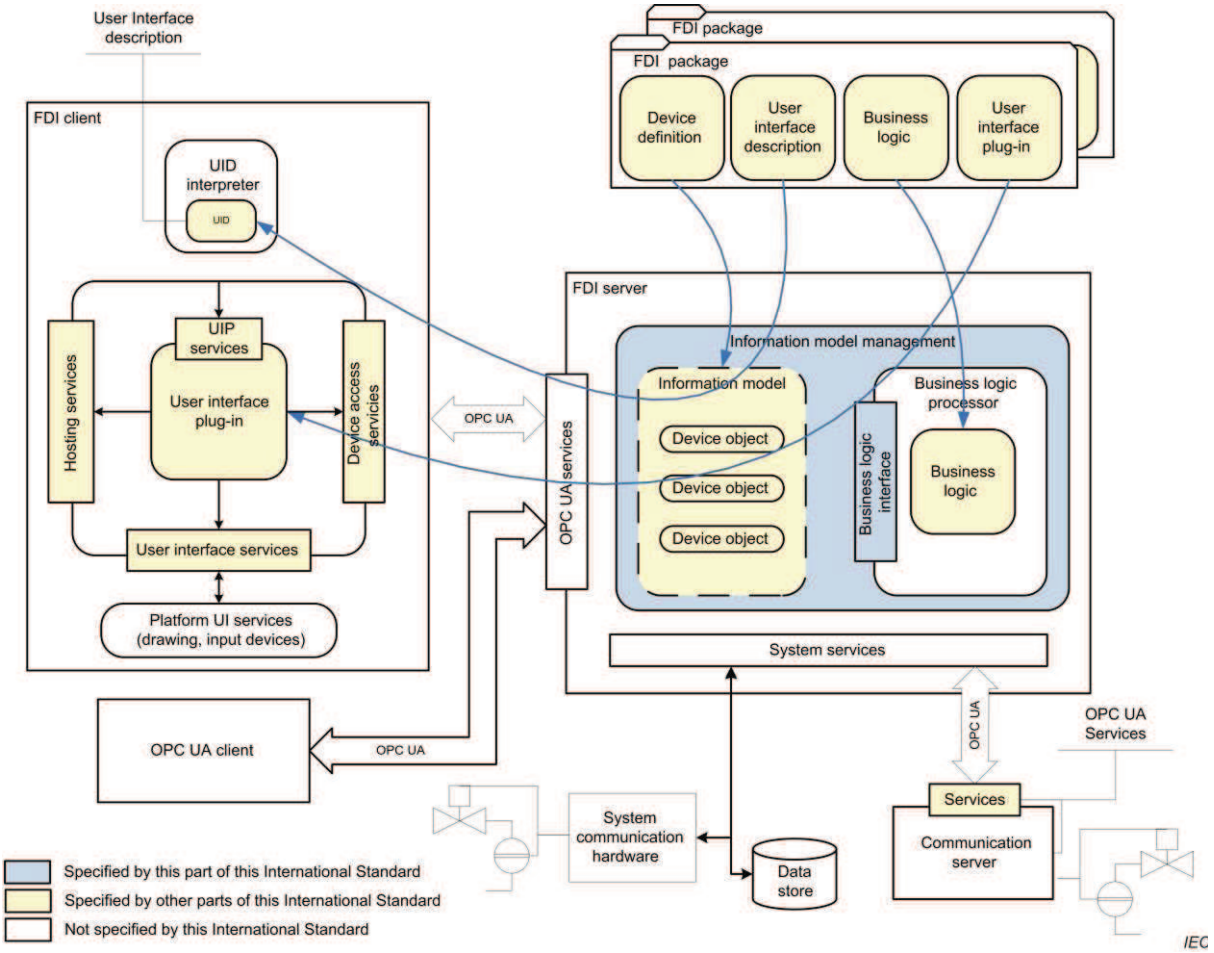

Figure 1 – FDI architecture diagram

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.

IEC 61804 (all parts), *Function blocks (FB) for process control and electronic device description language (EDDL)*

IEC 61804-4:2020, *Function blocks (FB) for process control and electronic device description language (EDDL) – Part 4: EDD interpretation*

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

IEC 62541-7, *OPC unified architecture – Part 7: Profiles*

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

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

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

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

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

3 Terms, definitions, abbreviated terms 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
Actions Proxy
internal FDI Server entity that encapsulates all the EDD Methods specified in an EDD Action definition

3.2 Abbreviated terms

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

3.3 Conventions

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

4 Overview

The structure for an FDI Server is shown in Figure 1.

FDI Servers that support connectivity with third-party FDI Clients shall support OPC UA. A vendor can provide both an FDI Server and one or more FDI Clients. In this case, the FDI Clients can communicate with the FDI Server through proprietary protocols.

An FDI Server communicates with devices via Native Communication (see 7.2.1) and/or Communication Devices (see IEC 62769-7).

An FDI Server provides information to FDI Clients through an Information Model (see IEC 62769-5) as follows.

- The Information Model includes information about Device Types and Device Instances. The information for a Device Instance includes offline data (engineering data), as well as online data (values from the physical device).
- The Information Model is created using information from FDI Packages. However, not all of the information in an FDI Package is reflected in the Information Model.
- Referential integrity of the Information Model is maintained using information from FDI Packages.
- FDI Packages can contain Attachments that contain device manuals and protocol-specific information (see IEC 62769-4). Those Attachments, including device manuals and protocol-specific support files, are exposed via the Information Model.
- FDI Device Packages contain information about device types (see IEC 62769-4). Each device type defined in a package is mapped to a distinct DeviceType node in the Information Model.

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- FDI Profile Packages are used to provide interaction with devices for which an FDI Device Package does not exist (see IEC 62769-4).
- Multiple revisions of an FDI Package generate distinct DeviceType nodes in the Information Model (see IEC 62769-4).

FDI Packages contain digital signatures that allow an FDI Server to authenticate their contents (see IEC 62769-4). An FDI Server shall not use an FDI Package if the digital signature provided by the FDI Package is invalid.

An FDI Server shall verify the FDI Technology Version (see IEC 62769-1) of any FDI Package it uses to ensure the FDI Package is compatible with the FDI Server.

The resulting functional structure of an FDI server is described in Annex A.

5 Information Model

5.1 General

The FDI Server shall use the Device Definition of an FDI Package to maintain the Information Model.

The Device Definition can contain conditional expressions. Conditional expressions are used when a certain aspect of the Device Definition is not static but rather is dependent on the state of the device. Whenever the online or offline values of a Device Instance are modified, the FDI Server shall re-evaluate the relevant conditional expressions and modify the Information Model accordingly.

The evaluation of conditional expressions can invalidate variables in the Information Model. The FDI Server shall change the AccessLevel attribute of invalidated variables such that they are neither readable nor writable and the status of these variables shall be set to bad. Read and write service requests for invalidated variables shall return a failure.

The Device Definition can specify relationships between variables in a device. These relationships can impact the value of variables in the Information Model.

The FDI Server shall generate DataChange Notifications to any FDI Clients that are subscribing to Information Model elements that have changed.

FDI Packages provide Business Logic that is used by the FDI Server to maintain the integrity of the Information Model. The Business Logic specified in an FDI Package can invoke builtin functions that shall be implemented by the FDI Server. The builtin functions that shall be implemented by the FDI Server are specified in IEC 61804-5.

5.2 Online/Offline

5.2.1 Overview

The Information Model maintained by the FDI Server contains online and offline values. The online values reflect values in a physical component/device. The offline values reflect values stored in a configuration database.

The offline values are updated through write service requests from an FDI Client or Business Logic executed by the FDI Server. The offline values are not updated when the FDI Server reads data from the device or writes data to the device.

The online values in the Information Model are not updated through write service requests. Successful write service requests through the Information Model result in value changes in the physical devices. The online values in the Information Model will then be updated as a result of read service requests or subscriptions.

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FDI Servers can provide a server-specific mechanism for creating Device Instances without the presence of physical hardware. The FDI Server creates these instances using information in FDI Packages. All read/write requests for online values for Device Instances with no physical device shall return an error.

The transfer of information between the offline values and the physical device is supported through the TransferToDevice and TransferFromDevice methods in the Information Model. These Methods shall implement the download and upload procedures, respectively, as specified in IEC 61804-4. When no implementation is provided based on IEC 61804-4, then these Methods shall return Bad_NotSupported, as per IEC 62541-4.

The Device shall have been locked prior to invoking these methods, as specified in IEC 62769-5.

5.2.2 Transfer to device

The TransferToDevice method shall implement the download procedure as specified in IEC 61804-4. This transfers the offline values to the physical device.

As a general rule, the FDI Server should not change the Online variable node when writing a value to the device. The Online variable node should be updated only in the process of read operations or subscriptions. Notwithstanding, as specified in IEC 62769-5, the FDI Server will reset any cached Value for the target Nodes in the Information Model so that they will be re-read next time they are requested.

The status information returned for each variable included in the write service request is used to compose the TransferResult, as specified in IEC 62769-5.

5.2.3 Transfer from device

The TransferFromDevice method shall implement the upload procedure as specified in IEC 61804-4. This transfers the values from the physical device to the offline values.

If any read operations from the device fail during upload, the corresponding offline value shall not be modified.

The status information returned for each variable included in the read service request is used to compose the TransferResult, as specified in IEC 62769-5.

5.3 Access privileges

Systems implement security and access policies based on a number of characteristics such as user role and plant area. FDI Servers use these policies, along with information in FDI Packages, to determine the access privileges granted to the user.

The elements of an FDI Package can be associated with one or more usage attributes. The FDI Server uses these attributes to set the UserAccessLevel attribute of Variables and the UserExecutable attribute of Methods. The usage attributes in an FDI Package are simply hints to be used by the FDI Server, i.e., they may be disregarded or overridden by the FDI Server. See also Annex B.

5.4 Private Parameters

The Parameters and Actions specified in an FDI Package may be declared private. Private Parameters and Actions shall not be browsable; they shall only be accessible through references from other elements of an FDI Package.

More specifically, the FDI Server shall support private Parameters and Actions as follows.

- The FDI Server shall create nodes in the Information Model for the private Parameters and Actions.
- The FDI Server shall not include information about private Parameters and Actions in a response to a Browse, BrowseNext, QueryFirst, or QueryNext service request.

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- The FDI Server shall return the NodeIds of private Parameters and Actions when the name of a private Parameter or Action is passed to TranslateBrowsePathsToNodeIds.
- The FDI Server shall process a read/write service request for a private Parameter in the same way as it does for public (browsable) Parameters (see 5.7 and 5.8).
- The FDI Server shall execute private Actions in the same way as it does public (browsable) Actions (see 5.12).

An example of private parameters is parameters that should only be modified through an Action. These parameters should not be visible to FDI Clients to prevent direct access. FDI Clients invoke Actions to access these private parameters.

5.5 Locking

The FDI Server provides locking services to grant FDI Clients exclusive access to Device and Network elements in the Information Model. The locking services consist of a set of Methods and status information. The methods, and their behavior, are specified in IEC 62769-5.

The following behavior shall be implemented by the FDI Server to support locks.

- Locking applies to both online and offline nodes.
- Once locked by one FDI Client, any attempt to write to a Parameter or to execute an Action by another FDI Client shall be rejected.
- Locking is not required for read services.
- Parameters that are locked by one FDI Client can still be read by other FDI Clients, i.e., read requests on a Parameter that is locked are not rejected.

Internal use of the locking mechanism for maintaining the Information Model integrity is FDI Server vendor-specific.

Figure 2 illustrates a locking sequence with multiple service invocations during the locked state.

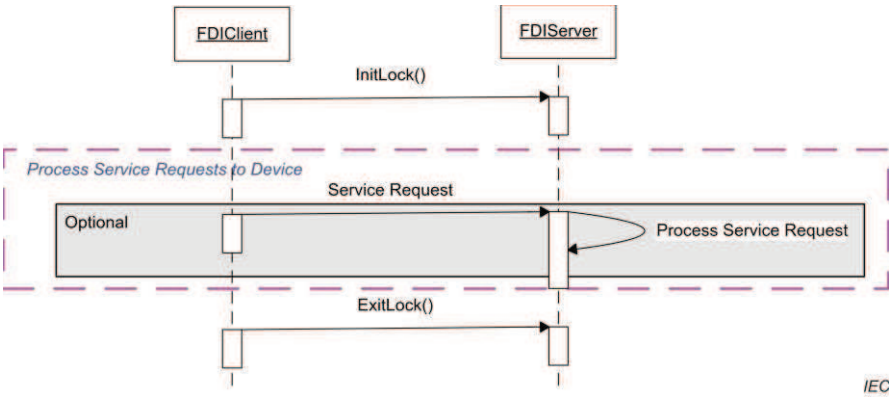

Figure 2 – Locking services

A service request that requires locking shall fail either partially or completely if no lock has been acquired by the FDI Client via InitLock prior to requesting the service. The FDI Client has to release the lock via ExitLock after all service requests have been completed.

A write operation will partially fail, i.e., it will return a status code for each variable in the set of variables to be written since some may belong to devices that are locked and some to devices that are not locked.

FDI Servers may queue InitLock requests until a service for which a lock has been created completes and the lock has been released. However, such an optimization is not part of the standard behavior required of an FDI Server.

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5.6 EditContext

5.6.1 Concept and usage model

The FDI Server provides the EditContext model to interact with Clients during their editing task. The concept is closely related to UIDs and fulfills the needs for Server-driven UI dialogs based on EDDL rules.

An EditContext can be used to make changes to Variable Values visible to the Server without applying them to the online or offline representation of a Device. The Server will apply business logic associated to the edited Variable, which – in some cases – causes changes to other Variable Values (e.g. if an engineering unit is changed) or the UID (e.g. a Variable becomes invisible). Thus, the Client can use an EditContext to modify (edit) Parameters such as engineering units, ranges and more, verify any side effects, and re-adjust the settings before applying the changes.

An FDI Server may implement different EditContext strategies:

- A single EditContext instance for all dialogues of an FDI Client.
- Multiple EditContext instances.
- Hierarchical EditContext instances.

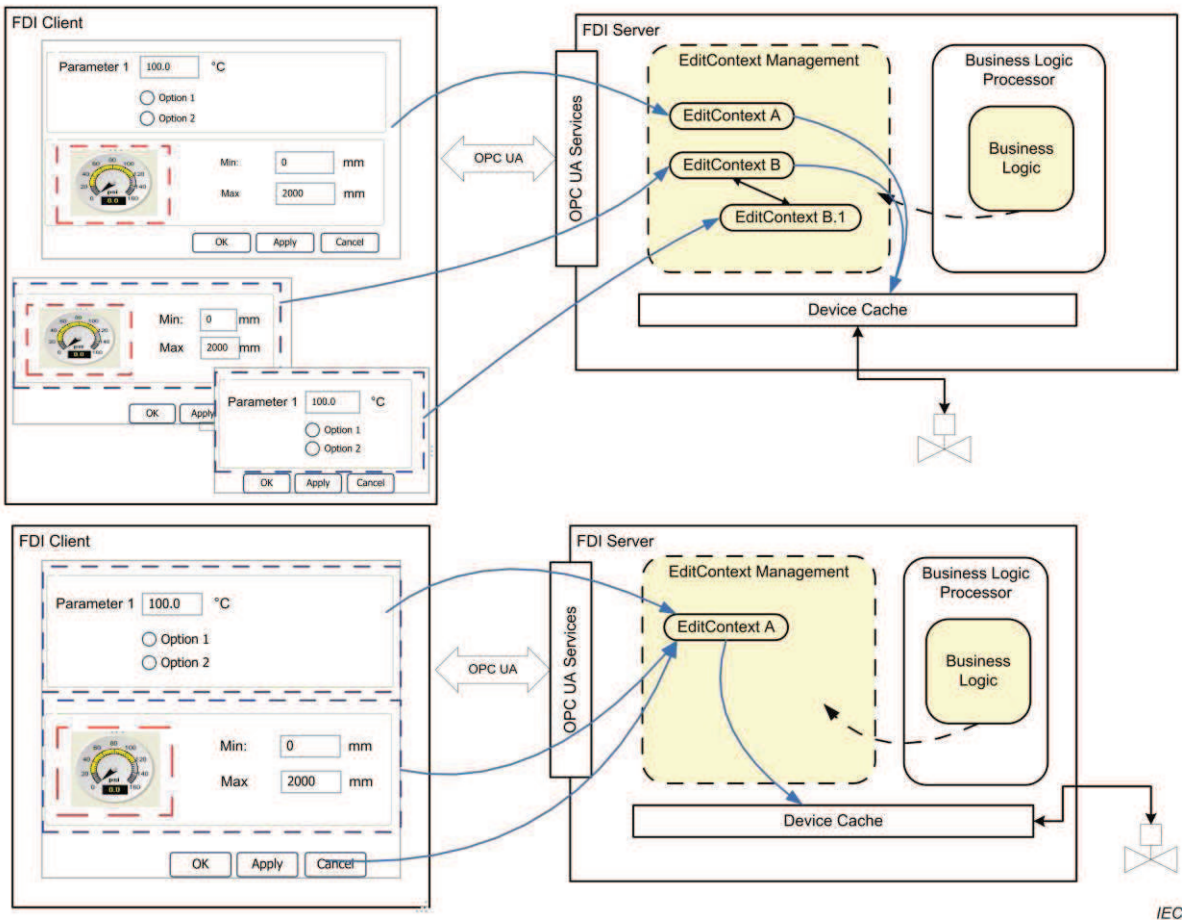

Figure 3 – EditContext models

Figure 3 shows two possible Server strategies and how the Client can adapt. In the lower scenario, the Server provides a single EditContext instance for all dialogs. Here, the Client groups all dialogs and exposes a single set of buttons to Apply and Cancel, because it always concerns all edits.

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