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Entwurf

**Feldgeräteintegration (FDI) –
Teil 7: FDI-Kommunikationsgeräte
(IEC 65E/594/CDV:2018);
Englische Fassung prEN 62769-7:2018**

Field Device Integration (FDI) –
Part 7: FDI Communication Devices
(IEC 65E/594/CDV:2018);
English version prEN 62769-7:2018

Intégration des appareils de terrain (FDI) –
Partie 7: Appareils de communication FDI
(IEC 65E/594/CDV:2018);
Version anglaise prEN 62769-7:2018

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2019-05-17 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfs besonders zu vereinbaren.

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Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 62 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

Nationales Vorwort

Die Englische Fassung des europäischen Dokuments prEN 62769-7:2018 „Feldgeräteintegration (FDI) – Teil 7: FDI-Kommunikationsgeräte“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 65E/594/CDV:2018 „Field Device Integration (FDI) – Part 7: FDI Communication Devices“ unverändert in den Entwurf prEN 62769-7:2018 übernommen worden.

Das internationale Dokument wurde vom SC 65E „Devices and integration in enterprise systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

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

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Der Zusammenhang der zitierten Dokumente mit den entsprechenden deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

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Da sich die Benutzer des vorliegenden Norm-Entwurfs der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der prEN 62769-7:2018 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Norm-Entwurfs hinzugefügt. Für einige der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Norm-Entwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

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Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

Änderungen

Gegenüber DIN EN 62769-7:2016-03 wurden folgende Änderungen vorgenommen:

- a) Unterstützung der allgemeinen Protokollerweiterung zur schnelleren Einführung anderer Technologien;
- b) Unterstützung von Package-Entwickler bei der Erstellung von EDDs für das heutige EDD-Basissystem mit einem einzigen Entwicklungswerkzeug;
- c) Die Digitale Signatur beinhaltet jetzt einen zuverlässigen Zeitstempel für die langfristige Validierung des FDI-Package;
- d) Laufende Benutzerschnittstellen-Plug-ins in einer Sandbox;
- e) Zeitstempel für die Signatur des Gerätepackage;
- f) Unterstützung neuer Protokolle;
- g) Allgemeine Protokollerweiterung zur Einführung von anderen Kommunikationsprotokollen;
- h) Basierend auf die allgemeine Protokollerweiterung: Modbus RTU.

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 die Elemente fest, mit denen die Kommunikationsleistungen erbracht und die als Kommunikationsgeräte bezeichnet werden (IEC 62769-5).

Die gesamtheitliche FDI-Architektur ist in Bild 1 dargestellt. Die im Anwendungsbereich dieses Dokuments liegenden Architekturkomponenten sind in diesem Bild hervorgehoben. Der Anwendungsbereich des Dokumentes hinsichtlich der FDI-Pakete ist auf die Kommunikationsgeräte begrenzt. Der in Bild 1 dargestellte Kommunikationsserver ist ein Beispiel für ein spezifisches Kommunikationsgerät.

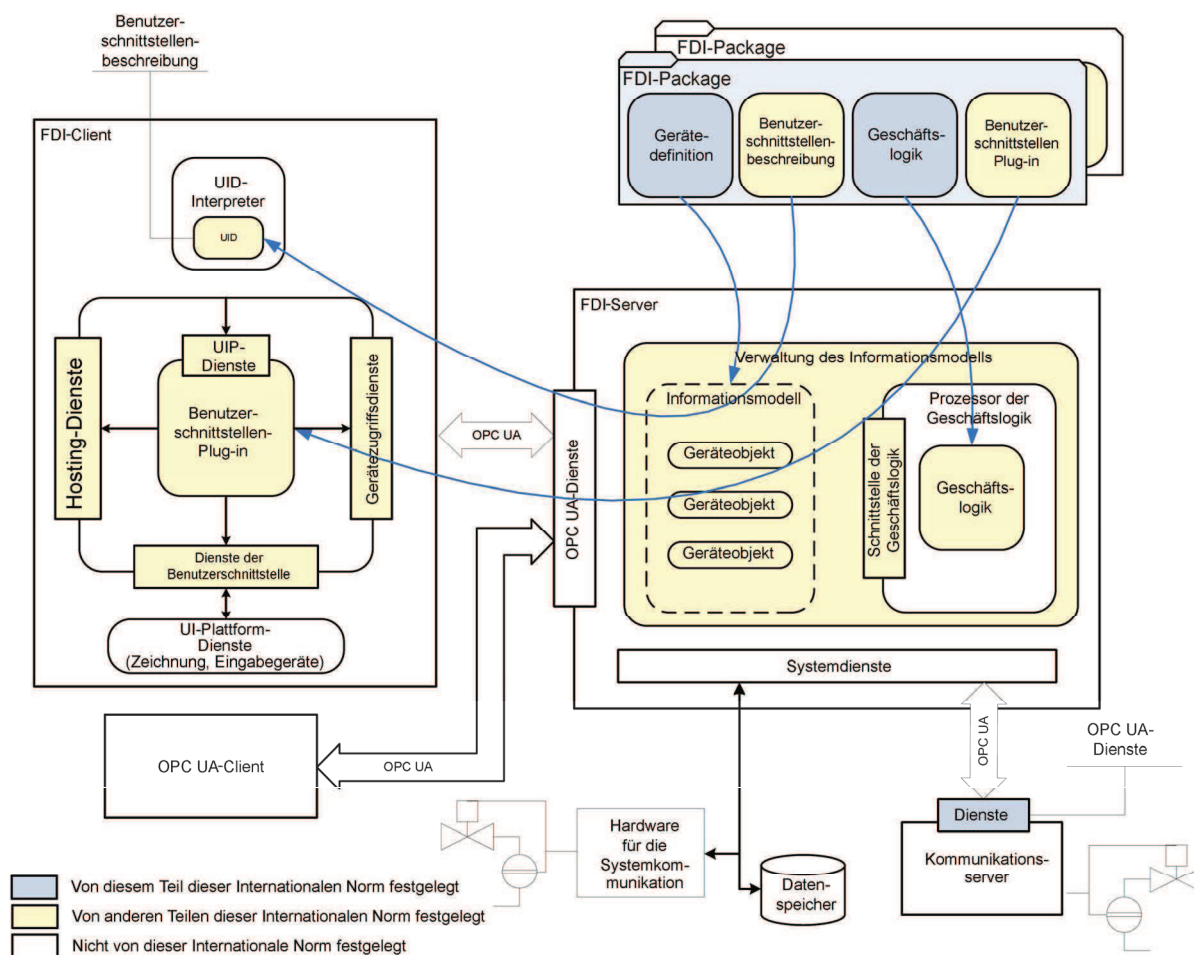


Bild 1 – FDI-Architektur

3 Begriffe, Abkürzungen und Konventionen

3.1 Begriffe

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

ISO und IEC stellen terminologische Datenbanken für die Verwendung 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>

3.1.1

Gateway

(en: gateway)

Kommunikationsgerät, welches die Verbindung zwischen verschiedenen physikalischen Netzen oder verschiedenen Protokollen ermöglicht

3.2 Abkürzungen

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

HTTP	Hypertext-Übertragungsprotokoll (en: Hypertext Transfer Protocol)
IP	Internetprotokoll (en: Internet Protocol)
PHY	Hardware für die physische Kommunikation (en: Physical communication hardware)
SNMP	Einfaches Netzwerkverwaltungsprotokoll (en: Simple Network Management Protocol)
TCP	Übertragungssteuerungsprotokoll (en: Transmission Control Protocol)
URI	Einheitlicher Quellenanzeiger (en: Uniform Resource Identifier)

3.3 Konventionen für die graphische Notation

In diesem Dokument wird die in IEC 62769-5 festgelegte graphischen Notation verwendet.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE INTEGRATION (FDI) –

Part 7: Communication devices

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62769 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) Support for generic protocol extension for faster adoption of other technologies
- b) Support for Package Developers to build EDDs targeted for today's EDD bases system under a single development tool.
- c) Digital signature now include trusted timestamping for long term validation of FDI Package

- 57
- 58 d) Running UIs in a sandbox
- 59 e) Time stamp for device package signature
- 60 f) Support of new protocols
- 61 g) Generic protocol extension to allow adoption of other communication protocols
- 62 h) Based on generic protocol extension: Modbus RTU;
- 63

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

FDIS	Report on voting
65E/XXX/FDIS	65E/XXX/RVD

65

66 Full information on the voting for the approval of this International Standard can be found in

67 the report on voting indicated in the above table.

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

69 The committee has decided that the contents of this document will remain unchanged until the

70 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to

71 the specific document. At this date, the document will be

- 72 • reconfirmed,
- 73 • withdrawn,
- 74 • replaced by a revised edition, or
- 75 • amended.
- 76

77 The National Committees are requested to note that for this document the stability date

78 is 2022.

79 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE

80 DELETED AT THE PUBLICATION STAGE.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

81

82

INTRODUCTION

83

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

- 86 – Part 1: Overview
- 87 – Part 2: FDI Client
- 88 – Part 3: FDI Server
- 89 – Part 4: FDI Packages
- 90 – Part 5: FDI Information Model
- 91 – Part 6: FDI Technology Mapping
- 92 – Part 7: FDI Communication Devices
- 93 – Part 100: Profiles – Generic Protocol Extensions
- 94 – Part 101-1: Profiles – Foundation Fieldbus H1
- 95 – Part 101-2: Profiles – Foundation Fieldbus HSE
- 96 – Part 103-1: Profiles – PROFIBUS
- 97 – Part 103-4: Profiles – PROFINET
- 98 – Part 109-1: Profiles – HART and WirelessHART
- 99 – Part 115-2: Profiles – Protocol-specific Definitions for Modbus RTU
- 100 – Part 150-1: Profiles – ISA 100.11a

101

FIELD DEVICE INTEGRATION (FDI) –
Part 7: Communication devices

1 Scope

This part of IEC 62769 specifies the elements implementing communication capabilities called Communication Devices (IEC 62769-5).

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. The document scope with respect to FDI Packages is limited to Communication Devices. The Communication Server shown in Figure 1 is an example of a specific Communication Device.

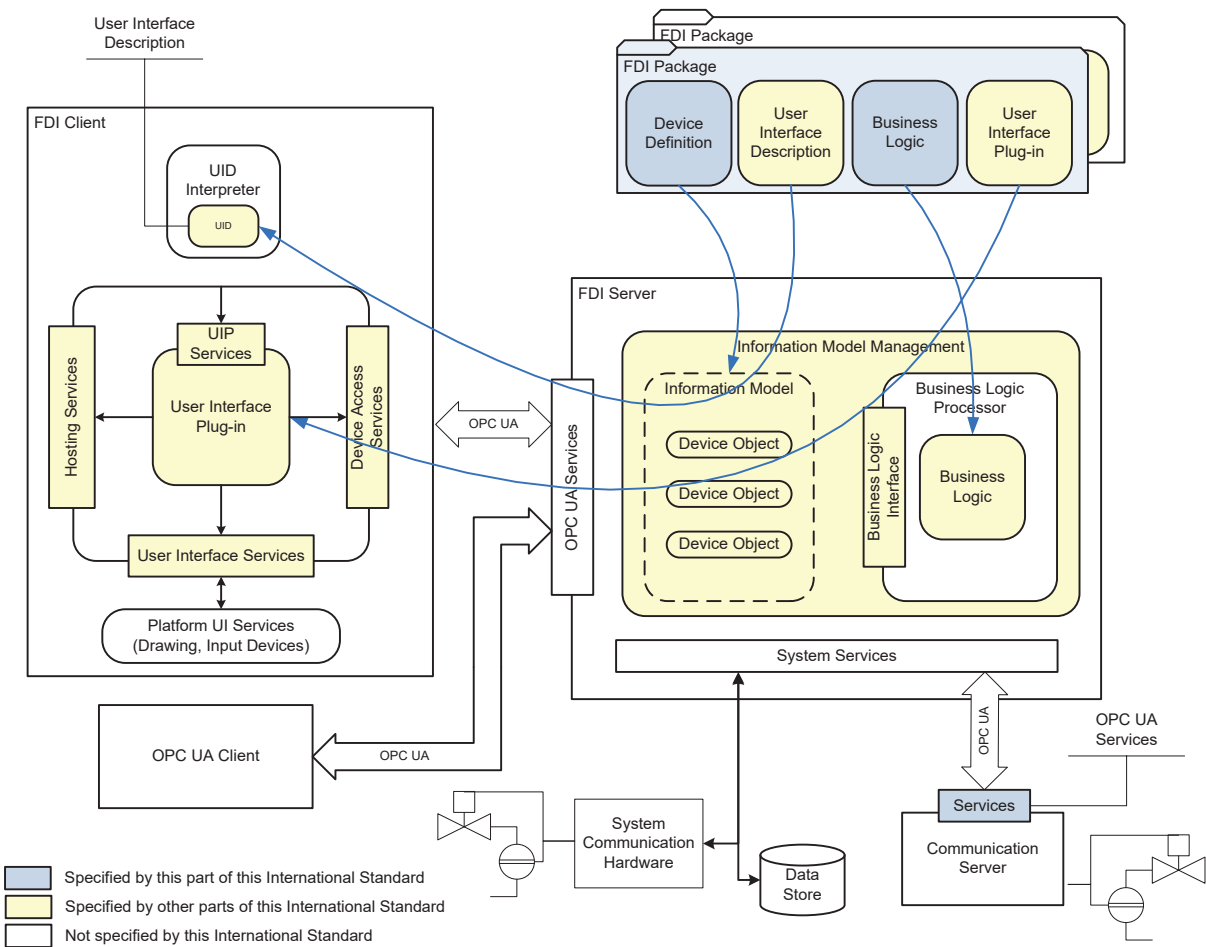


Figure 1 – FDI architecture diagram

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

IEC 61804-4, *Function blocks (FB) for process control and Electronic Device Description Language (EDDL) – Part 4: EDD interpretation*

- IEC 62541 (all parts), *OPC Unified Architecture*
- IEC TR 62541-1, *OPC Unified Architecture – Part 1: Overview and Concepts*
- IEC 62541-4, *OPC Unified Architecture – Part 4: Services*
- IEC 62541-6, *OPC Unified Architecture – Part 6: Mappings*
- IEC 62541-7, *OPC Unified Architecture – Part 7: Profiles*
- IEC 62541-100, *OPC Unified Architecture – Part 100: OPC UA for Devices*
- IEC 62769-1, *Field Device Integration (FDI) – Part 1: Overview*
- IEC 62769-2, *Field Device Integration (FDI) – Part 2: FDI Client*
- IEC 62769-3, *Field Device Integration (FDI) – Part 3: FDI Server*
- IEC 62769-4, *Field Device Integration (FDI) – Part 4: FDI Packages*
- IEC 62769-5, *Field Device Integration (FDI) – Part 5: FDI Information Model*
- IEC 62769-6, *Field Device Integration (FDI) – Part 6: FDI Technology Mapping*

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 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

gateway

communication device that enables to bridge between different physical networks or different protocols

3.2 Abbreviated terms and acronyms

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

HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
PHY	Physical communication hardware
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
URI	Uniform Resource Identifier

3.3 Conventions for graphical notation

This document uses the graphical notation defined in IEC 62769-5.

4 General

The abstract term FDI Communication Device represents an entity implementing communication functions over a network using a specific protocol. The group of FDI Communication Devices splits into two main groups.

- a) The FDI Communication Server is a dedicated OPC UA Server providing access to one or more field device networks. The FDI Communication Server is specified in Clause 7.
- b) The FDI Communication Gateway enables to bridge between different physical networks or different protocols. The bridging business logic is implemented in the EDD component that is provided with an FDI Communication Package. The FDI Communication Gateway is specified in Clause 8.

NOTE The main differences between a Gateway and a Communication Server are: in terms of FDI the FDI Communication Server is a dedicated OPC UA Server providing access to one or more field device networks. A Gateway is a communication device that enables to bridge between different physical networks or different protocols. The logical representation of a Gateway device within the FDI Server hosted Information Model enables the FDI Server to process communication in heterogeneous network topologies.

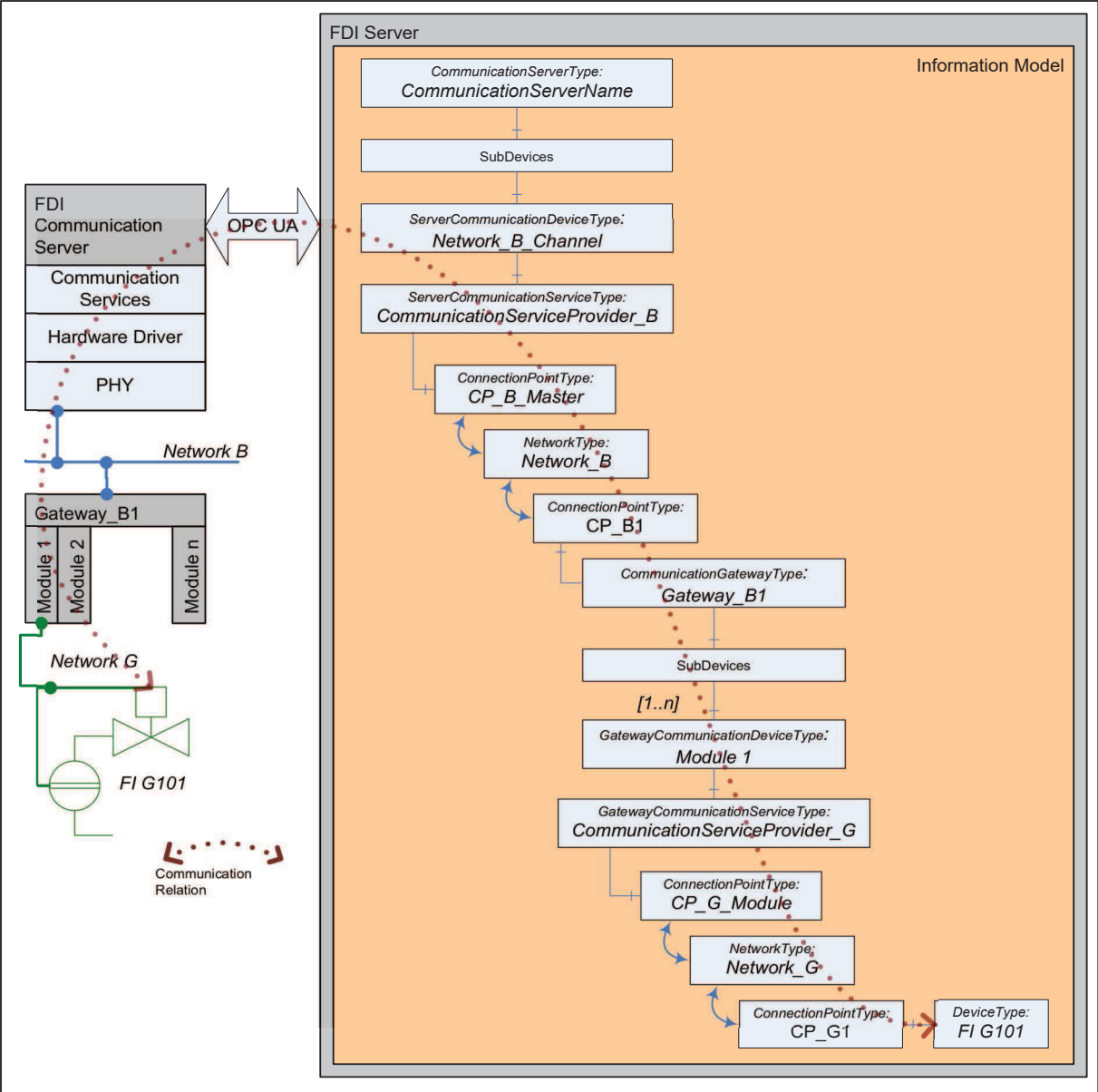


Figure 2 – FDI communication infrastructure architecture

The FDI Server hosted Information Model contains a representation of the network topology. (see also IEC 62769-5). The Information Model shown in Figure 2 is an example excerpt to illustrate how the Information Model used elements reflect the actual network topology.

- 1) The instance of `CommunicationServerType` (named `CommunicationServerName`) represents the FDI Communication Server. The FDI Communication Server implements physical communication network access (Communication hardware). Clause 7 describes related Information Model specifics, required FDI Communication Package content and handling of elements therein. For subdevices see IEC 62769-5.
- 2) The instance of `ServerCommunicationDeviceType` and `ServerCommunication-ServiceType` (named `Network_B_Channel`) maps to the FDI Communication Server implemented communication services. The `ServerCommunicationDeviceType` is specified in 7.3.3. The `ServerCommunicationServiceType` is specified in 7.3.4.
- 3) The instance of `CommunicationGatewayType` (named `Gateway_B1`) represents the physical Gateway. Clause 8 describes the related Information Model specifics, the required FDI Package content and the handling of elements therein.
- 4) The instance of `GatewayCommunicationDeviceType` (named `Module 1`) maps to a physical or logical module enabling communication to the network to which this module is connected. The `GatewayCommunicationDeviceType` is specified in 8.3.2.3. The related Gateway specifics are described in Clause 8.
- 5) The instance of `GatewayCommunicationServiceType` (named `CommunicationServiceProvider_G`) represents the Gateways' ability to process communication services. The Gateway specific implementation of `GatewayCommunicationServiceType` is based on Business Logic that enables to run communication services in heterogeneous communication networks.
- 6) A communication relation (more details are described in Clause 6) between a physical device and the device representation managed by the FDI Server is always associated to communication service objects that are instances of a `GatewayCommunicationServiceType` or `ServerCommunicationServiceType`. The ability of instantiating multiple communication service objects supports protocols enables to operate multiple logical connections between a bus master and a device.
- 7) The Information Model represents the connections between the physical devices shown on the left side of Figure 2 based on instances of `ConnectionPointType` `NetworkType` and the depicted relations. `ConnectionPointType` and `NetworkType` are specified in IEC 62769-5.

5 FDI Communication Package

5.1 General

The FDI Server imports the FDI Communication Package like any other FDI Device Package. Clause 5 specifies the FDI Communication Package details.

5.2 EDD

5.2.1 General rules

The FDI Communication Package contained EDD is not restricted, but bound to a protocol specific annex (IEC 62769-4:—, Annex F).

The EDD elements as specified in IEC 62769-4:—, Annex F, and provided with an FDI Communication Package shall describe:

- c) Parameter and parameter structures. Mandatory protocol specific parameter definitions are found in IEC 62769-4:—, Annex F. The parameters shall contain any parameter that requires adjustment for proper communication service operation.
- d) Physical Layer identification. Protocol specific definitions are found in IEC 62769-4:—, Annex F.

Communication devices modularity: The modularity information shall be based on using the EDDL constructs COMPONENT (see IEC 61804-3).

FDI envisions communication device modularity to cope with communication hardware providing multiple physical or logical communication channels to access multiple logical or physical communication networks. Each module element of the whole communication device shall be described by a separate EDD element.

- a) The COMPONENT definition shall be used to support the system implemented topology configuration. Protocol specific definitions are found in IEC 62769-4:—, Annex F. The related COMPONENT definitions are described in 5.2.2, 5.2.3, 5.2.4, and 5.2.7.
- b) The Business Logic shall contain a method enabled to validate the network (see 5.2.8). The validation function considers the elements only directly connected to the network. The validation function shall be referred by the EDDL specified CHECK_CONFIGURATION attribute.
- c) The Business Logic can contain a method enabled to validate the module configuration (see 5.2.9) or the network configuration (see 5.2.8). The validation function considers the elements only directly connected to the related parent element in the topology. The validation function shall be referred by the EDDL specified CHECK_CONFIGURATION attribute.
- d) Connection Point data: The Connection Point (see 5.2.4 and 5.2.6) shall be described through EDDL constructs COMPONENT, COLLECTION and VARIABLE. The COMPONENT definition associates the Connection Point element to the Communication Device. The VARIABLE definitions represent the properties of a specific Connection Point. The COLLECTION represents the Connection Point structure as such. Protocol specific definitions are found in IEC 62769-4:— Annex F.
- e) MENU:
The Menu structure shall follow the Menu conventions for PC based applications according to IEC 61804-4 enabling access to
 - 1) FDI Communication Device Type (Bus) parameters: These parameters shall be made accessible by means of "offline_root_menu".
 - 2) Topology Configuration Dialogs shall be made available by means of the menu entry point "topology_configuration".

5.2.2 Device component

Each FDI Communication Package shall contain an EDD element describing the device.

```

COMPONENT <DeviceComponentId>
{
    LABEL "<Label>";
    CAN_DELETE TRUE;
    CHECK_CONFIGURATION <ValidateModules>;
    CLASSIFICATION NETWORK_COMPONENT;
    COMPONENT_RELATIONS
    {
        <CommunicationDeviceRelationId>
    }
}

COMPONENT_RELATION <CommunicationDeviceRelationId>
{
    LABEL "Relation type description";
    RELATION_TYPE CHILD_COMPONENT;
    ADDRESSING {<AddressVar>}
    COMPONENTS
    {
        <CommunicationDeviceComponentId>
        {
            AUTO_CREATE <autoCreate>;
            REQUIRED_RANGES
            {
                <AddressVar>{ MIN_VALUE <AddrMin>; MAX_VALUE <AddrMax>;}
            }
        }
    }
    MINIMUM_NUMBER <minNumber>;

```

```

285     MAXIMUM_NUMBER <maxNumber>;
286 }
287

```

288 <DeviceComponentId>: The COMPONENT identifier identifies the component description for
 289 the device type.

290 <Label>: The string value shall contain a string that allows a human user to determine the
 291 function of the FDI Communication Server object.

292 <ValidateModules>: The Value refers to the METHOD implementing the module topology
 293 configuration validation function. (Implementation details are specified in 5.2.9.)

294 The attribute COMPONENT_RELATIONS allows to describe how modules can be connected. The
 295 definition of the COMPONENT_RELATIONS is optional. If used it shall describe the relations to
 296 the CommunicationDevice definitions. The construct enables to perform generic, FDI Server
 297 driven (device) topology configuration. Syntax details are described in IEC 61804-3. The
 298 subsequent text describes the semantic use of the COMPONENT_RELATION construct.

299 <CommunicationDeviceRelationId>: The attribute value identifies the
 300 COMPONENT_RELATION definition describing the relation between the device component
 301 and the CommunicationDevice component.

302 <CommunicationDeviceComponentId>: The attribute value has to match with a
 303 COMPONENT identifier used in a COMPONENT declaration that describes a
 304 CommunicationDevice (see 5.2.3).

305 <autoCreate>: The attribute value describes the number of CommunicationDevice
 306 components that can be automatically instantiated with the Device component.

307 <minNumber>/<maxNumber>/<autoCreate>: The attribute values define the instantiation
 308 constraints. The definition of these attributes is optional. The attribute values can contain
 309 conditional expressions.

310 The RELATION_TYPE shall be set to CHILD_COMPONENT.

311 <AddressVar>: The attribute value is a reference to a VARIABLE declaration. This VARIABLE
 312 holds the address value for a CommunicationDevice instance. The definition of this attribute is
 313 optional.

314 <AddrMin>/<AddrMax>: Values define the address value range for a CommunicationDevice
 315 instance. The value may for example correspond to a physical slot number. Usage of
 316 attributes ADDRESSING and REQUIRED_RANGES enables generic configuration routines.

317 5.2.3 CommunicationDevice component

318 Each FDI Communication Package shall contain at least one EDD element describing at least
 319 one CommunicationDevice component. A modular communication hardware structure shall be
 320 described by multiple CommunicationDevice COMPONENT descriptions:

```

321 COMPONENT <CommunicationDeviceComponentId>
322 {
323     LABEL "<Label>";
324     CAN_DELETE <CanDelete>;
325     CLASSIFICATION NETWORK_COMPONENT;
326     COMPONENT_RELATIONS
327     {
328         <CommunicationServiceProviderRelationId>
329     }
330 }
331

```

```

332 COMPONENT_RELATION <CommunicationServiceProviderRelationId>
333 {
334     LABEL "Relation between CommunicationDevice and communication service provider";
335     RELATION_TYPE CHILD_COMPONENT;

```