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Entwurf**Feldgeräteintegration (FDI) –
Teil 7: Kommunikationsgeräte
(IEC 65E/265/CD:2012), Text in Englisch**

Field Device Integration (FDI) –
Part 7: FDI Communication Devices
(IEC 65E/265/CD:2012), Text in English

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2012-12-17 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

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

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Gesamtumfang 61 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE

Nationales Vorwort

Die englische Originalfassung des internationalen Dokuments IEC 65E/265/CD:2012 „Field Device Integration (FDI) – Part 7: FDI Communication Devices“ (CD, en: Committee Draft) ist unverändert in diesen Norm-Entwurf übernommen worden.

Das internationale Dokument wurde vom SC 65E „Devices and integration in enterprise systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet und den nationalen Komitees zur Stellungnahme vorgelegt.

Die 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. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Da der Abstimmungszeitraum für einen FDIS bzw. Schluss-Entwurf prEN nur 2 Monate beträgt, und dann keine sachlichen Stellungnahmen mehr abgegeben werden können, sondern nur noch eine „JA/NEIN“-Entscheidung möglich ist, wobei eine „NEIN“-Entscheidung fundiert begründet werden muss, wird bereits der CD als DIN-Norm-Entwurf veröffentlicht, um die Stellungnahmen aus der Öffentlichkeit frühzeitig berücksichtigen zu können.

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

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf eine Norm ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils neueste gültige Ausgabe der in Bezug genommenen Norm.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe der Norm.

Der Zusammenhang der zitierten Normen mit den entsprechenden Deutschen Normen 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.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für den vorliegenden Normentwurf erfüllt.

Da sich die Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der IEC 62769-7 veröffentlicht. Zu deren Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Normentwurf 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.

Nationaler Anhang NA (informativ)

3 Begriffe, Abkürzungen und Konventionen

3.1 Begriffe

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

3.1.1

Gateway

(en: **Gateway**)

Kommunikationsgerät, das als Brücke zwischen verschiedenen physikalischen Netzwerken oder verschiedenen Protokollen dienen kann

– Leerseite –

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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 62769-7 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:

FDIS	Report on voting
65C/xxx/FDIS	65C/xxx/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 publication has been drafted in accordance with ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

- reconfirmed,

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

A bilingual version of this publication may be issued at a later date.

The National Committees are requested to note that for this publication the stability date is 2017.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

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

FIELD DEVICE INTEGRATION (FDI) –

Part 7: Communication devices

1 Scope

This International Standard specifies 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.

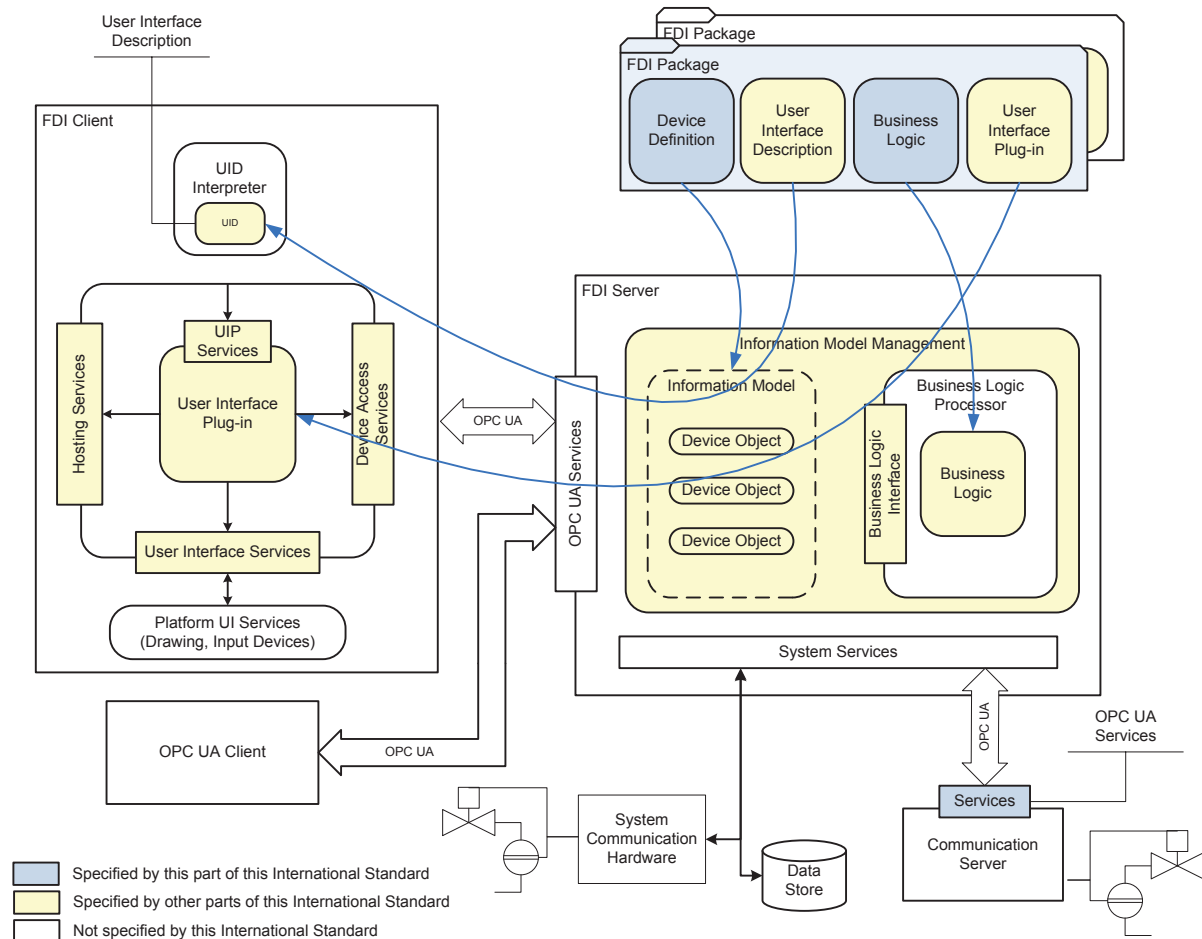


Figure 1 – FDI architecture diagram

2 Normative references

The following documents, 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.

- 20 IEC 61804-3:2014², *Function blocks (FB) for process control and Electronic device*
21 *description language (EDDL) – Part 3: EDDL syntax and semantics*
- 22 IEC 61804-4:2014², *Function blocks (FB) for process control and Electronic device description*
23 *language (EDDL) – Part 4: EDD interpretation*
- 24 IEC 62541-1, *OPC UA Specification – Part 1: Concepts*
- 25 IEC 62541-3, *OPC UA Specification – Part 3: Address Space Model*
- 26 IEC 62541-4, *OPC UA Specification – Part 4: Services*
- 27 IEC 62541-5, *OPC UA Specification – Part 5: Information Model*
- 28 IEC 62541-7, *OPC UA Specification – Part 7: Profiles*
- 29 IEC 62541-8, *OPC UA Specification – Part 8: Data Access*
- 30 IEC 62541-9, *OPC UA Specification – Part 9: Alarms & Conditions*
- 31 UA Part DI, *OPC Unified Architecture for Devices (DI) Companion Specification*
- 32 IEC 62769-1, *Field device integration (FDI) – Part 1: Overview*
- 33 NOTE IEC 62769-1 is technical identical to FDI-2021
- 34 IEC 62769-2, *Field device integration (FDI) – Part 2: FDI Client*
- 35 NOTE IEC 62769-2 is technical identical to FDI-2022
- 36 IEC 62769-3, *Field device integration (FDI) – Part 2: FDI Server*
- 37 NOTE IEC 62769-3 is technical identical to FDI-2023
- 38 IEC 62769-4, *Field device integration (FDI) – Part 2: FDI Packages*
- 39 NOTE IEC 62769-4 is technical identical to FDI-2024
- 40 IEC 62769-5, *Field device integration (FDI) – Part 5: FDI Information Model*
- 41 NOTE IEC 62769-5 is technical identical to FDI-2025
- 42 IEC 62769-6, *Field device integration (FDI) – Part 6: FDI Technology Mapping*
- 43 NOTE IEC 62769-6 is technical identical to FDI-2026
- 44 **3 Terms, definitions, abbreviated terms, acronyms and conventions**
- 45 **3.1 Terms and definitions**
- 46 For the purposes of this document, the terms and definitions given in IEC 62769-1 and the
47 following apply.

² To be published.

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
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
URI	Uniform Resource Identifier

3.3 Conventions for graphical notation

This document uses 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 EED 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.

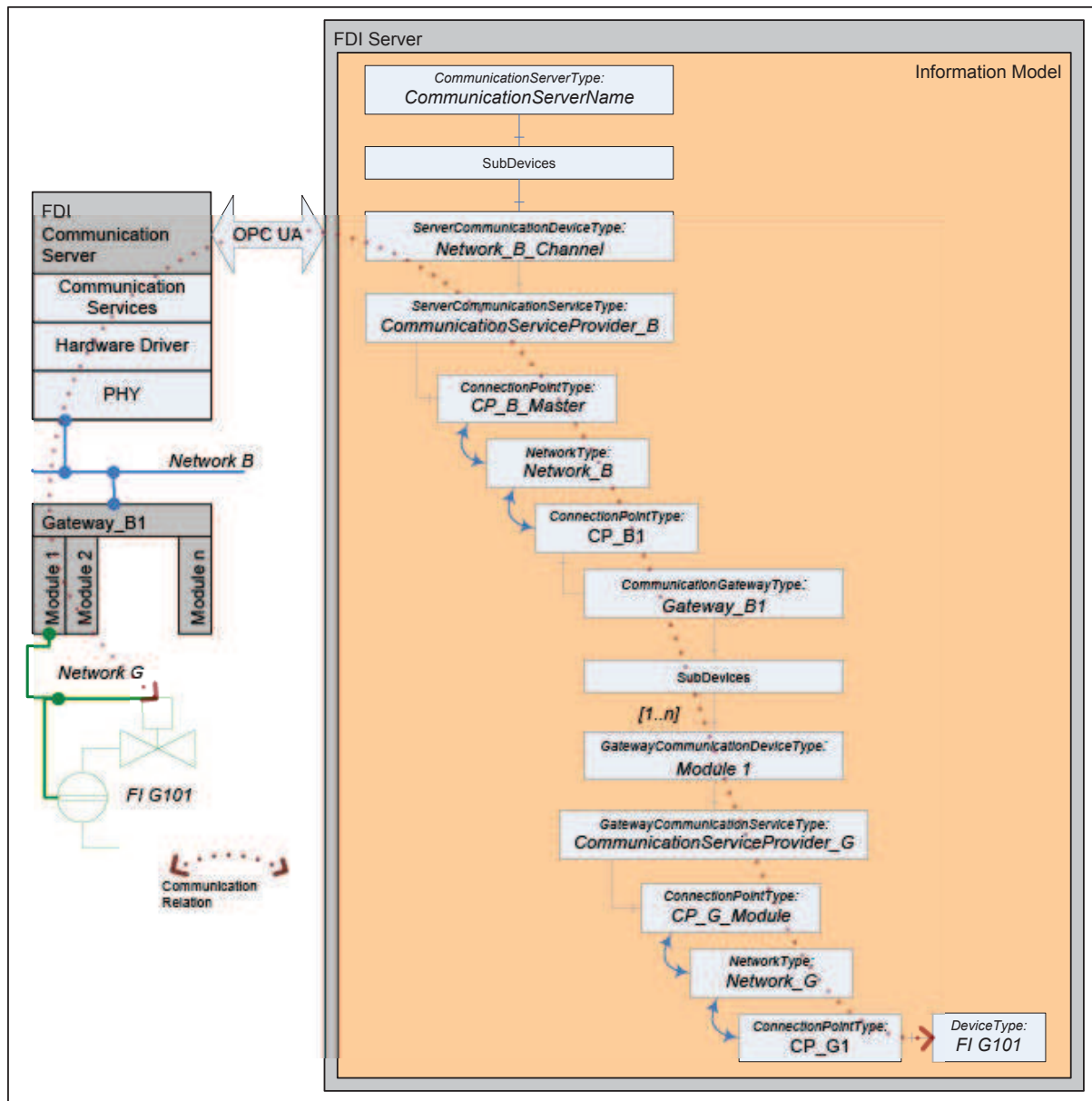


Figure 2 – FDI communication infrastructure architecture

The FDI Server hosted Information Model contains a representation of the network topology. (See also IEC 62769-3:2013, Clause 7) 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. (Subdevices see IEC 62769-5)
- 2) The instance of ServerCommunicationDeviceType and ServerCommunicationServiceType (named Network_B_Channel) maps to the FDI Communication Server implemented communication services. The ServerCommunicationDeviceType is specified in clause 7.3.3. The ServerCommunicationServiceType is specified in clause 7.3.4.
- 3) The instance of CommunicationGatewayType (named Gateway_B1) represents the physical Gateway. Clause 8 describes related Information Model specifics, required

FDI Package content and 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 clause 8.3.2.3. The related Gateway specifics are described in Clause 8.
- 5) The instance of GatewayCommunicationServiceType (named CommunicationServiceProvider_G) represents 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 described in 6) between a physical device and the device representation managed by the FDI Server is always associated to communication service objects that is an instance 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 depicted relations. ConnectionPointType and NetworkType are specified in IEC 62769-5.

5 FDI Communication Package

5.1 General

The FDI Server imports FDI Communication Package like any other FDI Device Package. Subsequent subclauses specify 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 62769-4:2013, Annex F).

The EDD elements as specified in IEC 62769-4:2013, Annex F provided with an FDI Communication Package shall describe:

- a) Parameter and parameter structures. Mandatory protocol specific parameter definitions are found in IEC 62769-4:2013, Annex F. The parameter shall contain any parameter that requires adjustment for proper communication service operation.
- b) Physical Layer identification. Protocol specific definitions are found in IEC 62769-4:2013, Annex F.
- c) Communication devices modularity: The modularity information shall be based on using 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.

- d) The COMPONENT definition shall be used to support the system implemented topology configuration. Protocol specific definitions are found in IEC 62769-4:2013, Annex F. The related COMPONENT definitions are described in 5.2.2, 5.2.3, 5.2.4, and 5.2.7.
- e) 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.
- f) 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.
- g) 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 62769-4:2013, Annex F.
- h) MENU: The Menu structure shall follow IEC 61804-4 defined "Menu conventions for PC based applications" enabling access to
 - i) FDI Communication Device Type (Bus) parameters: These parameters shall be made accessible by means of "offline_root_menu".
 - ii) Topology Configuration Dialogs shall be made available by means of menu entry point "topology_configuration". Protocol specific definitions are found in IEC 62769-4:2013, Annex F.

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>;

```

199 MAXIMUM_NUMBER <maxNumber>;
200 }
201

202 <DeviceComponentId>: The COMPONENT identifier identifies the component description for
203 the device type.

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

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

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

213 <CommunicationDeviceRelationId>: The attribute value identifies the
214 COMPONENT_RELATION definition describing the relation between the device component
215 and the CommunicationDevice component.

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

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

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

224 The RELATION_TYPE shall be set to COMPONENT_CHILD.

225 <AddressVar>: The attribute value is reference to a VARIABLE declaration. This VARIABLE
226 holds the address value for a CommunicationDevice instance. The definition of this attributes
227 is optional.

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

231 5.2.3 CommunicationDevice component

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

```
235 COMPONENT <CommunicationDeviceComponentId>
236 {
237     LABEL "<Label>";
238     CAN_DELETE <CanDelete>;
239     CLASSIFICATION NETWORK_COMPONENT;
240     COMPONENT_RELATIONS
241     {
242         <CommunicationServiceProviderRelationId>
243     }
244 }
```

```

245
246 COMPONENT_RELATION <CommunicationServiceProviderRelationId>
247 {
248     LABEL "Relation between CommunicationDevice and communication service provider";
249     RELATION_TYPE CHILD_COMPONENT ;
250     ADDRESSING {<AddressVar>}
251     COMPONENTS
252     {
253         <CommunicationServiceProviderId>
254         {
255             AUTO_CREATE <autoCreate>;
256         }
257     }
258     MINIMUM_NUMBER 1;
259     MAXIMUM_NUMBER <maxNumber>;
260 }
261

```

262 <CommunicationDeviceComponentId>: The COMPONENT identifier identifies the
263 CommunicationDevice component.

264 <Label>: The string value shall contain a human readable string allows a user to easily
265 determine the function of the CommunicationDevice component.

266 <CanDelete>: Allowed values are TRUE or FALSE. It depends on whether a
267 CommunicationDevice needs explicit configuration or whether the related communication
268 service provider object shall be automatically instantiated with the CommunicationDevice. If
269 attribute CAN_DELETE is set to FALSE CommunicationDevice configuration is static.

270 The definition of the COMPONENT_RELATIONS is mandatory. It describes the relation to the
271 communication service provider definition. The construct enables the FDI Server to instantiate
272 communication service provider components according to communication processing
273 demands. (Syntax details are described in IEC 61804-3.) Subsequent text describes the
274 semantic use of the COMPONENT_RELATION construct.

275 <CommunicationServiceProviderRelationId> The attribute value identifies the
276 COMPONENT_RELATION definition as such.

277 <CommunicationServiceProviderId>: The attribute value has to match with a
278 COMPONENT identifier used in a COMPONENT declaration that describes a communication
279 service provider (5.2.4).

280 <autoCreate>: The attribute value describes the number of communication service providers
281 that can be automatically instantiated with the CommunicationDevice component.

282 The RELATION_TYPE shall be set to COMPONENT_CHILD.

283 The PROTOCOL attribute shall not be set.

284 5.2.4 Communication service provider component

285 Each FDI Communication Package describing a Communication Device shall contain one
286 EDD element describing the communication service provider.

```

287 COMPONENT <CommunicationServiceProviderId>
288 {
289     LABEL "<Label>";
290     CAN_DELETE <CanDelete>;
291     CLASSIFICATION NETWORK_COMMUNICATION_SERVICE_PROVIDER;
292     COMPONENT_RELATIONS <CommunicationServiceProvidersConnectionPointRelationId>
293     {
294         <ConnectionPointRelationId>

```

```

295     }
296 }
297
298 COMPONENT_RELATION <CommunicationServiceProvidersConnectionPointRelationId>
299 {
300     LABEL "Relation between communication service provider and connection point";
301     RELATION_TYPE CHILD_COMPONENT ;
302     ADDRESSING {<AddressVar>}
303     COMPONENTS
304     {
305         < ConnectionPointId>
306         {
307             AUTO_CREATE 1;
308         }
309     }
310     MINIMUM_NUMBER 1;
311     MAXIMUM_NUMBER 1;
312 }
313

```

314 <CommunicationServiceProviderId>: The COMPONENT identifier identifies the
315 communication service provider.

316 <Label>: The string value shall contain a human readable string allows a user to easily
317 determine the function of the communication service provider object.

318 <CanDelete>: Allowed values are TRUE or FALSE. It depends on whether a communication
319 service provider can be flexibly instantiated according communication processing demands. If
320 attribute CAN_DELETE is set FALSE the number of communication service provider component
321 instantiation is static. The instantiation constraints declared through attributes
322 AUTO_CREATE, MINIMUM_NUMBER and MAXIMUM_NUMBER correspond to the
323 capabilities of currently supported protocols.

324 <byteOrder>: The value enables generic integration of n-byte data types (e.g. 4 byte Integer)
325 into communication message payload. The attribute value describes the byte order and shall
326 be either BIG_ENDIAN or LITTLE_ENDIAN.

327 The definition of the COMPONENT_RELATIONS is mandatory. It describes the relation to the
328 Connection Point definition. The construct enables to perform generic, FDI Server driven
329 topology configuration. (Syntax details are described in IEC 61804-3.) Subsequent text
330 describes the semantic use of the COMPONENT_RELATION construct.

331 The Connection Point shall automatically instantiated with the communication service provider
332 and there shall be exactly one (1) Connection Point instance connected to the communication
333 service provider. The instantiation constraints declared through attributes AUTO_CREATE,
334 MINIMUM_NUMBER and MAXIMUM_NUMBER correspond to the capabilities of currently
335 supported protocols.

336 <CommunicationServiceProvidersConnectionPointRelationId> The attribute value
337 identifies the COMPONENT_RELATION declaration as such.

338 <ConnectionPointId>: The attribute value has to match with a COMPONENT identifier used
339 for a COMPONENT declaration that describes a Connection Point (see 5.2.5).

340 The RELATION_TYPE shall be set to COMPONENT_CHILD.

341 The PROTOCOL attribute shall not be set.