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Home and Building Electronic Systems (HBES) - Part 6-2: IoT Semantic Ontology model description

Elektrische Systemtechnik für Heim und Gebäude (ESHG) - Teil 6-2: Beschreibung des IoT semantischen Ontologiemodells

Systèmes électroniques pour les foyers domestiques et les bâtiments (HBES) - Partie 6-2: Description du modèle ontologie sémantique loT

Document Preview

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ICS:

35.240.67	Uporabniške rešitve IT v gradbeništvu	IT applications in building and construction industry
97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

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Home and Building Electronic Systems (HBES) - Part 6-2: IoT Semantic Ontology model description

Systèmes électroniques pour les foyers domestiques et les bâtiments (HBES) - Partie 6-2: Description du modèle ontologie sémantique IoT Elektrische Systemtechnik für Heim und Gebäude (ESHG) -Teil 6-2: Beschreibung des IoT semantischen Ontologiemodells

This draft European Standard is submitted to CENELEC members for enquiry. Deadline for CENELEC: 2025-02-14.

It has been drawn up by CLC/TC 205.

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51 European foreword

52 This document (prEN 50090-6-2:2024) has been prepared by CLC/TC 205 "Home and Building 53 Electronic Systems (HBES)".

- 54 The following dates are proposed:
 - latest date by which the existence of this (doa) dav + 6 months document has to be announced at national level
 - latest date by which this document has to be (dop) dav + 12 months implemented at national level by publication of an identical national standard or by endorsement
 - latest date by which the national standards (dow) dav + 36 months conflicting with this document have to be (to be confirmed or withdrawn modified when voting)
- 55 This document will supersede EN 50090-6-2:2021 and all of its amendments and corrigenda (if any).
- 56 prEN 50090-6-2:2024 includes the following significant technical changes with respect to EN 50090-6-57 2:2021:
- 58 To be completed.

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59 **1 Scope**

This document defines the HBES Information Model and a corresponding data exchange format for the Home and Building HBES Open Communication System.

62 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.

- 67 EN 50090-1:2011, Home and Building Electronic Systems (HBES) Part 1: Standardization structure
- 68 EN 50090–6-3:2023, Home and Building Electronic Systems (HBES) Part 6-3: 3rd Party HBES IoT 69 API

70 **3** Terms, definitions and abbreviations

71 3.1 Terms and definitions

- For the purposes of this document, the terms and definitions given in EN 50090-1:2011 and the following apply.
- 74 ISO and IEC maintain terminological databases for use in standardization at the following addresses:
- 75 IEC Electropedia: available at https://www.electropedia.org/
- 76 ISO Online browsing platform: available at <u>https://www.iso.org/obp</u>
- 77 **3.1.1**
- 78 actuator **Document Preview**
- 79 point performing an actuation (executed by a specific procedure, with an expected result) that
- 80 changes an Installation state during Runtime

ttp 81/sta Note 1 to entry: catalog/standards/sist/69b3131c-fd2a-4bef-9ea8-f6388146f33e/osist-pren-50090-6-2-2025

- 82 The term Actuator can be mapped to sosa:Actuator in the SSN Ontology.
- 83 The subject *actuation* can be mapped to sosa:Actuation in the SSN Ontology.
- 84 The subject *procedure* can be mapped to sosa:Procedure in the SSN Ontology.
- 85 The subject *result* can be mapped to sosa:Result in the SSN Ontology.

86 3.1.2

87 Application Function

- use of a set of Functions to achieve the desired behaviour of a technical system, typically using a
 combination of devices exchanging information via their input and output Datapoints
- Note 1 to entry: An Application Function may be split into several Functional Blocks with their input and output
 Datapoints that are logically connected to each other. The Functional Blocks may be located in one or more
 devices.
- 93 EXAMPLE Application Functions examples are "direct electrical heating", "electrical heating with 94 accumulators", "warm water heating", "fan coil air-conditioning" ...
- 95 Note 2 to entry: The Application Function and Application are meant to be the same. Reason to introduce an 96 alias term is to use a clear (understandable) reference from Application/ Application Function to the 97 corresponding KIM class:ApplicationFunction or to the Function in the Management Client.

98 **3.1.3**

99 aspect

100 specific perspective on a system that contains things with different properties, or referencing 101 mechanism to organize KIM elements in a specific perspective

EXAMPLE A Function Point is an ex officio Aspect with an important specific perspective. It is a referencing
 mechanism to organize together all to a Function Point interoperating Points (all GOs linked to a GA).

104 **3.1.4**

105 **BIM**

106 Building Information Model

107 digital process to describe and document a building in all its life cycle phases, from its planning, 108 construction, operation up to its demolition

109 **3.1.5**

- 110 channel
- 111 collection of Datapoints of a device that are logically related to each other typically by association with 112 a hardware feature or a specific function of that device
- 113 Note 1 to entry: These Datapoints may be derived from one or more defined Functional Blocks or may be an
- expansion above and beyond defined Functional Blocks or may be independent of a Functional Block if none is defined for the function associated with the Channel. The concept of a Channel is well-understood by the market
- 116 participant, e.g. installers.

117 **3.1.6**

- 118 datapoint
- 119 logical input entity of a device acting as recipient of Installation state data, whereas a logical output of 120 a device acts as source of Installation state data
- 121 Note 1 to entry: In case of implementation as a Group Object, state data are communicated with the use of
- 122 Function Points.
- 123 Note 2 to entry: The term Datapoint is the common term; to specifically denote a Datapoint available on an IoT 124 3rd Party API, the term IoT Datapoint is used.
 - oSIST prEN 50090-6-2

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- 126 device
- 127 physical element that is part of the network
- 128 Note 1 to entry: It is a physical, concrete object that a customer can buy.
- 129 **3.1.8**
- 130 endpoint
- 131 entry point to a service, a process, or a queue or topic destination in service-oriented architecture
- 132 **3.1.9**

133 Feature of Interest

134 **FOI**

- abstraction of a real-world thing (phenomenon, equipment, person, event...) defined by its observableor actuatable properties
- 137 Note 1 to entry: In colloquial terms, a FOI is a property carrier.
- 138 Note 2 to entry: A Sensor operates on a FOI with observable properties, an Actuator with actuatable properties.

139 Note 3 to entry: A FOI is not a "classification/type" tag itself; the "classification/ type" is accomplished with the 140 help of tags. Examples are defined in 4.5.1.4.

- 141 **3.1.10**
- 142 function
- 143 part of the intended behaviour of a Functional Block in a building context
- 144 **3.1.11**
- 145 Functional Block
- 146 **FB**
- one or more Functions that belong together and that cannot be separated across two devices but big enough that a device with only one such Functional Block could be marketed
- 149 Note 1 to entry: A Functional Block has a well-defined black box behaviour.
- 150 **3.1.12**
- 151 Function Point
- 152 **FP**
- 153 runtime system state information of a specific Application Function
- 154 Note 1 to entry: Shared by at least two Datapoints.
- Note 2 to entry: Has a unique identifier that addresses a group of controlled objects. This identifier is called aGroup Address.
- 157 EXAMPLE < Light Switch > in living room on/off, whereas the < ... > is the Function Point name
- 158 **3.1.13**
- 159 Group Address
- 160 **GA**
- 161 numerical identifier of a Function Point (https://standards.iteh.ai)
- 162 **3.1.14**
- 163 Group Communication
- 164 communication model in which one sender communicates information to one and typically more 165 receivers

166 Note 1 to entry: In IoT, this can be realized by simple UDP communication or by using a message broker 167 system or other.

- 168 **3.1.15**
- 169 Group Object
- 170 **GO**
- object which is foreseen for Group Communication using Group Address(es), which may be accessed
 via point-to-point communication without an assigned Group Address and becoming a member of that
- Function Point represented by the Group Address when assigned Group Address
- 174 **3.1.16**

175 HBES Information Model

- ontology based model of HBES System relevant parts, including additional semantic (dictionary)information
- 178 Note 1 to entry: It is managed by the KNX Association, hence the abbreviation KIM.
- 179 **3.1.17**

180 Industry Foundation Classes

181 **IFC**

- 182 open standard to describe BIM data in a digital way
- 183 Note 1 to entry: IFC data and models are specified in ISO 16739-1.

184 **3.1.18**

185 installation

- assembly of materials and components (devices) placed in position to provide a service
- 187 Note 1 to entry: An Installation is a deployed system (e.g. HVAC system or fire protection system) and consists
 188 of equipment and Functions that are used for a particular purpose.
- 189 Note 2 to entry: In relation to this term created data correlates to the installation model, described in 4.2.
- 190 [SOURCE: ISO 6707-1:2020, modified added "(devices)" and Notes to entry.]

191 **3.1.19**

192 IoT Datapoint

- 193 Endpoint at an IoT 3rd Party API that:
- a) corresponds to one or more Function Points, such as a state data representation of a discrete
 state in a building context; and
- b) is a fully qualified URL e.g. provided by an IoT 3rd Party Server
- 197 EXAMPLE 1 <a)> brightness → discrete state "brightness" is represented by the value 65 (percent)
- 198 EXAMPLE 2 https://gateway.knx.local/knx/api/v1/datapoints/{ld}
- 199 **3.1.20**
- 200 IoT Function
- 201 Function at an IoT 3rd Party API that: en Standards
- 202 is as a collection of IoT Datapoints that fulfils a by the user intended behaviour

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- 203 EXAMPLE "living room rear light dimming", "kitchen floor heating"
- Note 1 to entry: In a Mac, an IoT Function is instantiated data of a MaC Function in an Installation respectively
 MaC project. The MaC Function itself may base on an Application Function.

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tt 206 sta **3.1.21**, iteh ai/catalog/standards/sist/69b3131c-fd2a-4bef-9ea8-f6388146f33e/osist-pren-50090-6-2-2025 207 IoT 3rd Party API

set of requirements and regulations through which partial access to an Installation can be gained by offering a collection of Endpoints

210 **3.1.22**

211 IoT 3rd Party Client

- 212 device or service interacting with the Installation from outside using the IoT 3rd Party API
- Note 1 to entry: The IoT 3rd Party Client connects to a single device that provides the IoT 3rd Party API and can use this single device to fully interact with the Installation, possibly depending on a specified authorization mechanism.
- 216 EXAMPLE 1 A mobile phone (from inside the network, or from an Internet connection) with typically short 217 period connections.
- 218 EXAMPLE 2 A weather service permanently feeding in its weather information using the IoT 3rd Party API.

219 **3.1.23**

220 IoT 3rd Party Server

221 device that implements the IoT 3rd Party API

Note 1 to entry: This can be a dedicated device; this can be a function of a device that supports other HBES
 IoT and non HBES functionalities; it may be located within the local LAN of the IoT installation or outside.

224 3.1.24

225 MaC Catalog Entry

- 226 created management client data correlating to the product model, described in 4.2
- 227 3.1.25

228 **MaC Function**

- 229 Application Function created by the MaC and assigned to a building structure element, grouping 230 several Group Addresses
- 231 3.1.26

232 MaC Project

- 233 project created by a MaC documenting the Configuration of an Installation
- 234 3.1.27
- 235 **Management Client**
- 236 MaC
- 237 means to configure and commission Devices as well as to plan, design and diagnose an entire 238 Installation
- 239 Note 1 to entry: The MaC is used to configure and commission Devices, as well as to plan, design and 240 diagnose an entire Installation. As a final step the MaC writes specific configuration data such as Device 241 parameters to the Devices.
- 242 3.1.28
- ontology 243
- 244 conceptual descriptions of things that have a real-world commonality sharing the knowledge of a domain, mainly expressed with OWL CII Standards 245
- 246 Note 1 to entry: Ontologies are a structured way to describe the meaning of data in ontology classes and 247 should not be mixed up with common data model structures.
- 248 3.1.29
- 249 **Object Property**

OP

- 250
- 251 <in OWL> built-in concept that connects pairs of individuals
- - 252 Note 1 to entry: An object property expression represents the (entire) relationship between the pairs of 253 individuals.
 - 254 3.1.30
 - 255 OWL
 - 256 OWL 2 Web Ontology Language, informally OWL 2, specified by the World Wide Web Consortium 257 (W3C), mainly serialized with XML syntax for RDF (RDF/XML)
 - 258 Note 1 to entry: In this specification the abbreviation OWL is always an explicit reference to OWL 2.
 - 3.1.31 259
 - 260 point
 - 261 interface to data in the system
 - 262 Note 1 to entry: This document uses the term Point as an umbrella for data that can be accessed from outside
 - 263 of the Device, for instance to interact with other Points from other Devices. Consequently, term Point is a generic 264 superset of the term Datapoint (which describes more precisely the technics how the "data" in the system are 265 structured and/or coded).

266 **3.1.32**

267 Point API

simple RESTful (CoAP or HTTP) application programming interface designed for, but not limited to, constrained class 2 devices [RFC 7228] supporting device individualization, device linking and accessing device runtime data

- 271 EXAMPLE Functional Block or Channel Datapoints.
- 272 **3.1.33**
- 273 Quality Kind
- 274 **QK**
- certain combination of observable or actuatable properties, available as predefined parts of the
 Semantic Dictionary or created individually during Configuration, it being the case when a Quality
 Kind with the intended combination of properties respectively tags is not (yet) part of the dictionary
- 278 Note 1 to entry: A QK is not a "classification/type" tag itself; the "classification/ type" is accomplished with the 279 help of tags. Examples are defined in 4.5.1.4.
- 280 **3.1.34**
- 281 RDF

282 **Resource Description Framework**

- standard model for data interchange on the Web
- 284 Note 1 to entry: RDF is specified by the https://www.w3.org/RDF/

285 Note 2 to entry: RDF is a framework to represent information in the web by using triples. The information can 286 be serialized and stored in many formats such as the TURTLE or JSON(-LD) format. The general RDF concept 287 description can be found under <u>https://www.w3.org/TR/rdf11-concepts/</u>

288 [SOURCE: https://www.w3.org/RDF/, Notes 1 and 2 to entry added.]

289 3.1.35 Document Prev

- 290 runtime
- 291 process-to-process communication of data between devices, opposing to Configuration

<u>oSIST prEN 50090-6-2:202</u>;

292 Note 1 to entry: This concerns mainly the communication of Datapoint values (control and status information). 0-6-2-2025

- 293 **3.1.36**
- 294 Semantic Export
- 295 project exported by the MaC reflecting an Installation in a linked data format
- 296 Note 1 to entry: The exported data are:
- 297 structured according to the KIM, such as using Object Properties defined in KIM;
- 298 annotated with additional semantic information from the Semantic Dictionary;
- 299 referencing concepts of external Ontologies.

300 3.1.37

- 301 semantic dictionary
- 302 set of standardized terms allowing to annotate required parts of an Installation
- 303 Note 1 to entry: For details, see 4.2.9.
- 304 **3.1.38**
- 305 sensor
- 306 point performing an observation (executed by a specific procedure, triggered by a stimulus),
- 307 responding a *result* as an Installation state during Runtime

- 308 Note 1 to entry:
- 309 The term Sensor can be mapped to sosa:Sensor in the SSN Ontology.
- 310 The subject observation can be mapped to sosa:Observation in the SSN Ontology.
- 311 The subject stimulus can be mapped to ssn:Stimulus in the SSN Ontology.
- 312 The subject procedure can be mapped to sosa:Procedure in the SSN Ontology.
- 313 The subject *result* can be mapped to sosa:Result in the SSN Ontology.
- 314 **3.1.39**
- 315 tag
- 316 annotation term used to extend available data with (in most cases) well known standardized 317 information from a dictionary (in contrast to user defined, arbitrary term)
- 318 Note 1 to entry: A Tag is a concept-less term, without an integration in a broader concept such as the concept 319 of a Datapoint (used in an Application Function), it has a limited semantic meaning.
- 320 EXAMPLE Term "flow" has a weak meaning on its own, but if you relate it in a FOI with the other term 321 "water" this expresses at least that you observe/ actuate the water flow.
- 322 In this specification a Tag is almost exclusively a term from the Semantic Dictionary.
- 323 **3.1.40**
- 324 thing description
- 325 **TD**
- 326 semantic metadata model to describe (abstract or physical) things
- 327
 Note 1 to entry:
 It is specified by the thing description https://www.w3.org/TR/wot-thing-description/ and thing https://www.w3.org/2019/wot/td
- **Document Previe**
- 329 Note 2 to entry: TD relevant relations are described in the clause of Semantic Export.

330 3.2 Abbreviations

<u>oSIST prEN 50090-6-2:2025</u>

- 131 For the purposes of this document, the following abbreviations apply.
 - DHWC Domestic Hot Water Controller
 - FOI Function of Interest
 - BOC Boiler Controller
 - BUC Burner Controller
 - FTC Flow Temperature Controller
 - GA Group Address
 - GO Group Object
 - FB Functional Block
 - FP Function Point
 - HBES Home and Building Electronic Systems
 - HDTRT Heat Demand Transformer Room Temperature
 - HFDM Heat Flow Demand Manager
 - HIRC Heating Individual Room Controller
 - HPM Heat Producer Manager

- HVA Heating Valve Actuator
- HZC Heating Zone Controller
- IFC Industry Foundation Classes
- IOO Info On off
- IO Input Output
- IoT Internet of Things
- KIM HBES Information Model managed by KNX Association
- KNXA KNX Association
- MaC Management Client
- OP Object Property
- QK Quality Kind
- RSM Room Setpoint Manager
- RTC Room Temperature Controller
- RTS Room Temperature Sensor
- SOO Switch on/off
- TD Thing Description

332 4 HBES Information Model Chandrads

333 4.1 Introduction

334 4.1.1 General

Facility management often uses heterogeneous visualization tools and applications to maintain a
 building control system. For this, an Installation is created based on a MaC project that includes
 instantiated devices and application functions assigned to specific locations. HBES IoT defines the
 HBES Information Model (abbreviated as KIM) to describe a MaC project with semantic information.

A MaC can export project data with additional semantic information (so-called Semantic Export); other clients or tools can import this project data. This is an easy and powerful way to integrate existing project data into a third-party tool or any service of choice.

342 4.1.2 Models

343 The KIM consists of several models, extended with HBES related definitions, as shown in Figure 1.

344 Together they describe the different aspects of the building control domain.

HBES Information Model

Core model

Aspect/Asset/Point/....

Location model

Tag model

Tag

HBES model

Building/Floor/Room/....

Channel/Datapoint Type/...

345

346	346 Figure 1 — Main HBES Information Model sources		
347 348	Ea ent	ch model uses an individual namespace prefix, defines a specific set of semantically standardized ities and relationships amongst them.	
349	1)	Core model	
350		Describes the common concepts of the building control domain for an Installation.	
351		EXAMPLE A datapoint (I/O interface) of a device.	
352	2)	Location model Document Preview	
353		Describes the spatial location structure of an Installation. 2025	
354		EXAMPLE A location structure representing a building with rooms, floors, and others.	
355	3)	Tag model	
356 357		Describes a set of entities used as indications for information classification. Each entity has a standardized semantical meaning that is independent of an Installation.	
358 359		EXAMPLE A device with datapoints, each assigned with specific entities, such as output or temperature.	
360	4)	HBES model	
361		Describes HBES System specific entities of an Installation.	
362 363		EXAMPLE A device with datapoints (core model concepts), whereby a specific datapoint type is assigned to each datapoint (an HBES model concept), such as a boolean type for the values on or off.	
The HBES Model is derived from the Core, Tag and Location models in this standard. The entire HBES Information Model (KIM) can be seen as an aggregation of the models.			
366 367	 366 HBES Information Model = Core/ Location/Tag/HBES model + Semantic Dictionary (see 367 Clause 4.2) 		
368	NO	TE The separation between a model and its entities is needed to extend/ update them independently.	