SLOVENSKI STANDARD
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Stanovanjski in stavbni elektronski sistemi (HBES) - 6-2. del: Semantični opis ontološkega modela

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 IoT

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This draft European Standard is submitted to CENELEC members for enquiry.
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It has been drawn up by CLC/TC 205.

If this draft becomes a European Standard, 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.

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European Committee for Electrotechnical Standardization
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European foreword

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

The following dates are proposed:

• latest date by which the existence of this document has to be announced at national level	(doa)	dav + 6 months
• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	dav + 12 months
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	dav + 36 months (to be confirmed or modified when voting)

This document will supersede EN 50090-6-2:2021 and all of its amendments and corrigenda (if any).

prEN 50090-6-2:2024 includes the following significant technical changes with respect to EN 50090-6-2:2021:

To be completed.

1 Scope

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

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.

EN 50090-1:2011, *Home and Building Electronic Systems (HBES) - Part 1: Standardization structure*

EN 50090–6-3:2023, *Home and Building Electronic Systems (HBES) - Part 6-3: 3rd Party HBES IoT API*

3 Terms, definitions and abbreviations

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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
actuator
point performing an *actuation* (executed by a specific *procedure,* with an expected *result*) that changes an Installation state during Runtime

Note 1 to entry:

— The term Actuator can be mapped to sosa:Actuator in the SSN Ontology.

— The subject *actuation* can be mapped to sosa:Actuation in the SSN Ontology.

— The subject *procedure* can be mapped to sosa:Procedure in the SSN Ontology.

— The subject *result* can be mapped to sosa:Result in the SSN Ontology.

3.1.2
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.

EXAMPLE Application Functions examples are “direct electrical heating”, “electrical heating with accumulators”, “warm water heating”, “fan coil air-conditioning” …

Note 2 to entry: The Application Function and Application are meant to be the same. Reason to introduce an alias term is to use a clear (understandable) reference from Application/ Application Function to the corresponding KIM class:ApplicationFunction or to the Function in the Management Client.

3.1.3
aspect
specific perspective on a system that contains things with different properties, or referencing 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).

3.1.4
BIM
Building Information Model
digital process to describe and document a building in all its life cycle phases, from its planning, construction, operation up to its demolition

3.1.5
channel
collection of Datapoints of a device that are logically related to each other typically by association with a hardware feature or a specific function of that device

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 participant, e.g. installers.

3.1.6
datapoint
logical input entity of a device acting as recipient of Installation state data, whereas a logical output of a device acts as source of Installation state data

Note 1 to entry: In case of implementation as a Group Object, state data are communicated with the use of Function Points.

Note 2 to entry: The term Datapoint is the common term; to specifically denote a Datapoint available on an IoT 3rd Party API, the term IoT Datapoint is used.

3.1.7
device
physical element that is part of the network

Note 1 to entry: It is a physical, concrete object that a customer can buy.

3.1.8
endpoint
entry point to a service, a process, or a queue or topic destination in service-oriented architecture

3.1.9
Feature of Interest
FOI
abstraction of a real-world thing (phenomenon, equipment, person, event…) defined by its observable or actuatable properties

Note 1 to entry: In colloquial terms, a FOI is a property carrier.

Note 2 to entry: A Sensor operates on a FOI with observable properties, an Actuator with actuatable properties.

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

3.1.10
function
part of the intended behaviour of a Functional Block in a building context

3.1.11
Functional Block
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

Note 1 to entry: A Functional Block has a well-defined black box behaviour.

3.1.12
Function Point
FP
runtime system state information of a specific Application Function

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 a Group Address.

EXAMPLE < Light Switch > in living room on/off, whereas the < … > is the Function Point name

3.1.13
Group Address
GA
numerical identifier of a Function Point

3.1.14
Group Communication
communication model in which one sender communicates information to one and typically more receivers

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

3.1.15
Group Object
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

3.1.16
HBES Information Model
ontology based model of HBES System relevant parts, including additional semantic (dictionary) information

Note 1 to entry: It is managed by the KNX Association, hence the abbreviation KIM.

3.1.17
Industry Foundation Classes
IFC
open standard to describe BIM data in a digital way

Note 1 to entry: IFC data and models are specified in ISO 16739-1.

3.1.18
installation
assembly of materials and components (devices) placed in position to provide a service

Note 1 to entry: An Installation is a deployed system (e.g. HVAC system or fire protection system) and consists of equipment and Functions that are used for a particular purpose.

Note 2 to entry: In relation to this term created data correlates to the installation model, described in 4.2.

[SOURCE: ISO 6707-1:2020, modified – added “(devices)” and Notes to entry.]

3.1.19
IoT Datapoint
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

EXAMPLE 1 <a)> brightness → discrete state “brightness” is represented by the value 65 (percent)

EXAMPLE 2 <b)> https://gateway.knx.local/knx/api/v1/datapoints/{Id}

3.1.20
IoT Function
Function at an IoT 3rd Party API that:

— is as a collection of IoT Datapoints that fulfils a – by the user – intended behaviour

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.

3.1.21
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

3.1.22
IoT 3rd Party Client
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.

EXAMPLE 1 A mobile phone (from inside the network, or from an Internet connection) with typically short period connections.

EXAMPLE 2 A weather service permanently feeding in its weather information using the IoT 3rd Party API.

3.1.23
IoT 3rd Party Server
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.

3.1.24
MaC Catalog Entry
created management client data correlating to the product model, described in 4.2

3.1.25
MaC Function
Application Function created by the MaC and assigned to a building structure element, grouping several Group Addresses

3.1.26
MaC Project
project created by a MaC documenting the Configuration of an Installation

3.1.27
Management Client
MaC
means to configure and commission Devices as well as to plan, design and diagnose an entire Installation

Note 1 to entry: The MaC is used to configure and commission Devices, as well as to plan, design and diagnose an entire Installation. As a final step the MaC writes specific configuration data such as Device parameters to the Devices.

3.1.28
ontology
conceptual descriptions of things that have a real-world commonality sharing the knowledge of a domain, mainly expressed with OWL

Note 1 to entry: Ontologies are a structured way to describe the meaning of data in ontology classes and should not be mixed up with common data model structures.

3.1.29
Object Property
OP
<in OWL> built-in concept that **connects** pairs of individuals

Note 1 to entry: An object property expression **represents** the (entire) relationship between the pairs of individuals.

3.1.30
OWL
OWL 2 Web Ontology Language, informally OWL 2, specified by the World Wide Web Consortium (W3C), mainly serialized with XML syntax for RDF (RDF/XML)

Note 1 to entry: In this specification the abbreviation OWL is always an explicit reference to OWL 2.

3.1.31
point
interface to data in the system

Note 1 to entry: This document uses the term Point as an umbrella for data that can be accessed from outside of the Device, for instance to interact with other Points from other Devices. Consequently, term Point is a generic superset of the term Datapoint (which describes more precisely the technics how the “data” in the system are structured and/or coded).

3.1.32
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

EXAMPLE Functional Block or Channel Datapoints.

3.1.33
Quality Kind
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

Note 1 to entry: A QK is not a “classification/type” tag itself; the “classification/ type” is accomplished with the help of tags. Examples are defined in 4.5.1.4.

3.1.34
RDF
Resource Description Framework
standard model for data interchange on the Web

Note 1 to entry: RDF is specified by the https://www.w3.org/RDF/

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

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

3.1.35
runtime
process-to-process communication of data between devices, opposing to Configuration

Note 1 to entry: This concerns mainly the communication of Datapoint values (control and status information).

3.1.36
Semantic Export
project exported by the MaC reflecting an Installation in a linked data format

Note 1 to entry: The exported data are:

— structured according to the KIM, such as using Object Properties defined in KIM;

— annotated with additional semantic information from the Semantic Dictionary;

— referencing concepts of external Ontologies.

3.1.37
semantic dictionary
set of standardized terms allowing to annotate required parts of an Installation

Note 1 to entry: For details, see 4.2.9.

3.1.38
sensor
point performing an *observation* (executed by a specific *procedure,* triggered by a *stimulus*), responding a *result* as an Installation state during Runtime

Note 1 to entry:

— The term Sensor can be mapped to sosa:Sensor in the SSN Ontology.

— The subject observation can be mapped to sosa:Observation in the SSN Ontology.

— The subject stimulus can be mapped to ssn:Stimulus in the SSN Ontology.

— The subject *procedure* can be mapped to sosa:Procedure in the SSN Ontology.

— The subject *result* can be mapped to sosa:Result in the SSN Ontology.

3.1.39
tag
annotation term used to extend available data with (in most cases) well known standardized information from a dictionary (in contrast to user defined, arbitrary term)

Note 1 to entry: A Tag is a concept-less term, without an integration in a broader concept such as the concept of a Datapoint (used in an Application Function), it has a limited semantic meaning.

EXAMPLE Term “flow” has a weak meaning on its own, but if you relate it in a FOI with the other term “water” this expresses at least that you observe/ actuate the water flow.

In this specification a Tag is almost exclusively a term from the Semantic Dictionary.

3.1.40
thing description
TD
semantic metadata model to describe (abstract or physical) things

Note 1 to entry: It is specified by the thing description https://www.w3.org/TR/wot-thing-description/ and thing Ontology https://www.w3.org/2019/wot/td

Note 2 to entry: TD relevant relations are described in the clause of Semantic Export.

3.2 Abbreviations

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

4 HBES Information Model

4.1 Introduction

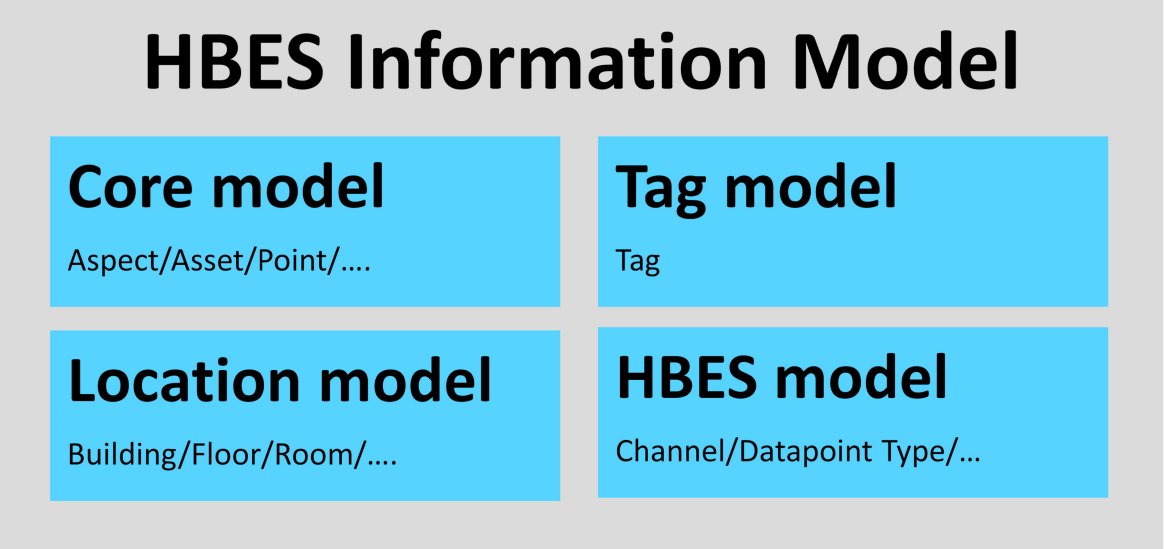
4.1.1 General

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.

4.1.2 Models

The KIM consists of several models, extended with HBES related definitions, as shown in Figure 1. Together they describe the different aspects of the building control domain.



345

346 **Figure 1 — Main HBES Information Model sources**

347 Each model uses an individual namespace prefix, defines a specific set of semantically standardized
348 entities 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

353 Describes the spatial location structure of an Installation.

354 EXAMPLE A location structure representing a building with rooms, floors, and others.

355 3) Tag model

356 Describes a set of entities used as indications for information classification. Each entity has a
357 standardized semantical meaning that is independent of an Installation.

358 EXAMPLE A device with datapoints, each assigned with specific entities, such as output or
359 temperature.

360 4) HBES model

361 Describes HBES System specific entities of an Installation.

362 EXAMPLE A device with datapoints (core model concepts), whereby a specific datapoint type is
363 assigned to each datapoint (an HBES model concept), such as a boolean type for the values on or off.

364 The HBES Model is derived from the Core, Tag and Location models in this standard. The entire
365 HBES Information Model (KIM) can be seen as an aggregation of the models.

366 **HBES Information Model = Core/ Location/Tag/HBES model + Semantic Dictionary** (see
367 Clause 4.2)

368 NOTE The separation between a model and its entities is needed to extend/ update them independently.