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

Systèmes électroniques pour les foyers domestiques et les bâtiments (HBES) Partie 6-2: Semantic Ontology Model Description pour l'internet des objets

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ICS:

35.240.67	Uporabniške rešitve IT v gradbeništvu	IT applications in building and construction industry
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Home and Building Electronic Systems (HBES)- Part 6-2 IoT Semantic Ontology_Model_Description

To be completed

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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.

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Contents

Page

European foreword

This document (prEN 50090-6-2:2020) has been prepared by CLC/TC 205 “Home and Building Electronic Systems (HBES)”.

This document is currently submitted to the Enquiry.

The following dates are proposed:

• latest date by which the existence of this document has to be announced at national level	(doa)	dor + 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)	dor + 12 months
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	dor + 36 months (to be confirmed or modified when voting)

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

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 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

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

IoT	Internet of Things
HBES	Home and Building Electronic Systems

4 HBES Information Model (Ontology)

4.1 Motivation

The current HBES model/ data information is based on XML, is managed by the KNX Association and has its corresponding versioning. Project/ product data exported by existing HBES management clients are in line with this XML schema.

Even if XML itself is a well-known and widespread format, it has its drawbacks in the context of sharing model/ project data information with external clients using this data. HBES management clients use the XML schema mainly to define the corresponding data structures to store/ export project and product data. Consequently, the XML schema is always updated when a new management client version is published, when new project and/or product features demand also a change of the data structures. This requires always a synchronization with the external clients to announce new XML schema versions.

The aim and motivation is to define a HBES Information Model and a corresponding data exchange format:

— The model expresses only the current - by external clients requested - information

— The model can be also easily updated

— The exported data uses a widely used data exchange format, which should also be readable by humans, means they are a text based.

This model and data exchange format is more stable, compared to the frequent HBES management client evolution.

- The HBES Information Model will be available as ontology in one or more formats, such as turtle files.
- The data exported by HBES management clients will be available as linked data, such as JSON-LD files.

The HBES IoT protocol suite shall support semantic information, both for runtime as well as for configuration.

This information shall be brought to the system components in a data driven way, by the HBES management clients software and possible other sources. It shall thus build on the information provided by the HBES management clients user, to avoid having to be entered again in the 3rd Part Client configuration.

The semantic information shall comply with the HBES standard and be available as public information. Technically this information will be available as linked data, expressed with triples.

The use of semantics itself allows to formalize, restrict, and verify the usage of HBES subjects to describe entities, relationships, and tags (entities have some relationship predicate to some other entities— essentially a directed edge in a graph).

This simple (triple) structure enables the succinct and elegant composition of large, interconnected structures of facility (building) subsystems.

4.2 Introduction

The HBES system is designed for direct exchange of information (i.e. communication) between networked devices controlling applications in and around buildings. See Figure 1.

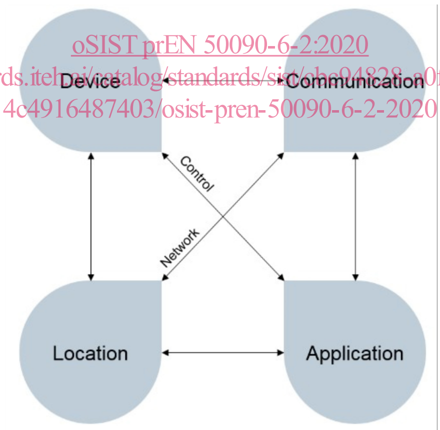

Figure 1 — HBES environment

These different aspects of the HBES environment are reflected by an individual “model” for Location, Devices, Applications as well as the Communication for exchange of control information. All individual model parts together form the entire HBES IoT Information Model as a single ontology. Ontologies are a structured way to describe the meaning of data and should not be mixed up with common data model structures. Ontologies work with the term “concepts” to describe things that have a real-world commonality. In the ontology itself such things are expressed technically as ontology classes.

For simplification the term model will be used further down. Figure 2 describes the HBES Information Model parts. It contains the following:

- Equipment (devices and other physical assets)
- Application Software (software to run the intended system behaviour)

— Point (interface to interact with data points mainly provided by devices

— Aspects (grouped points that identify a specific view/perspective to the system)

— Location (structural building elements)

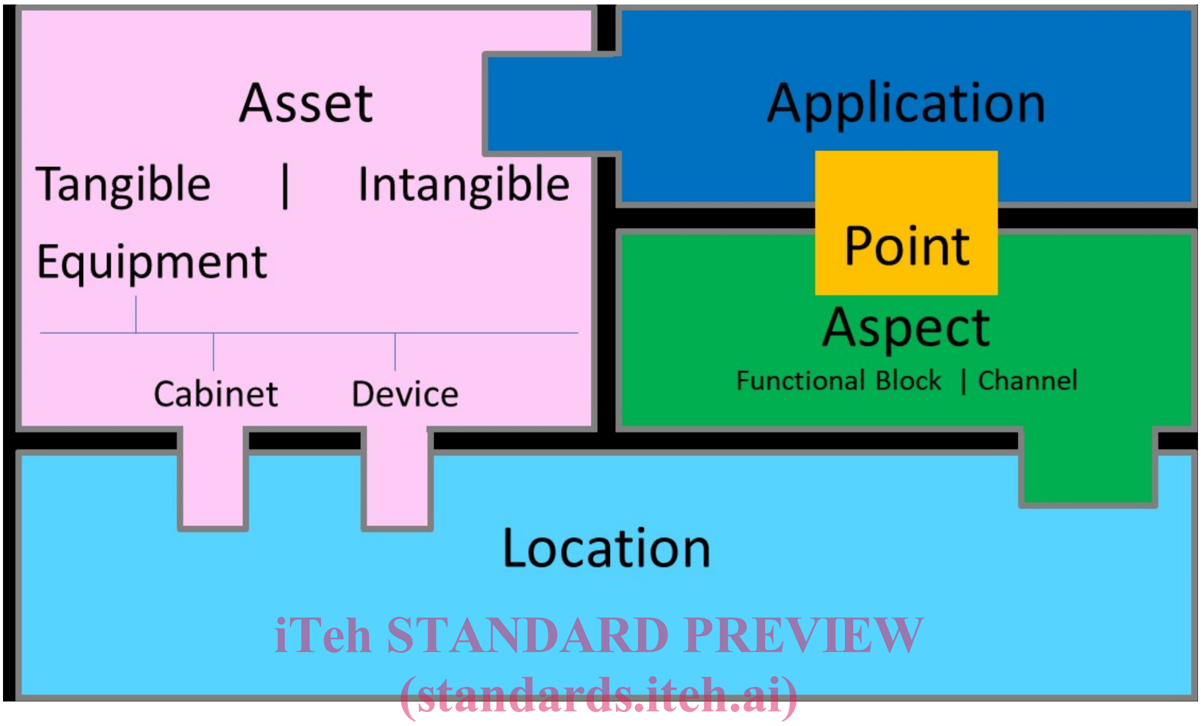

Figure 2 — HBES Information Model

The HBES Information Model builds upon other work in several ways.

It is inspired by the BRICK concept to model Points, Equipment and Context and their relationships.

It can be extended with tagging vocabulary such as Haystack.

In addition, it uses the location concepts from IFC and allows a semantic representation to utilize its flexibility and extensibility. For this the HBES Information Model supports an explicit mapping to IFC with a so called “bridging” ontology. The HBES-IFC mapping, respectively the bridging is available as electronic turtle file under https://schema.knxiot.org/ontology/owl-mapping/knx-ifc-mapping.

The current HBES Information Model does not consider other aspects of a HBES installation such as for instance topology or device models.

5 Location Model

5.1 Introduction

The Location model wishes to address the following requirements.

— Bridging to BIM

Many concepts of the Location model match concepts provided by the Industry Foundation Class Ontology (ifcowl) that has been created to work with BIM models. In particular, *Building*, *Floor* and *Space* map to IfcBuilding, IfcBuildingStorey and IfcSpace and thus make bridging to a BIM model quite easy.

— Alternate hierarchies

The common superclass *Location* of HBES IoT Information Model allows specifying an alternate location hierarchy or not strictly sticking to the usual hierarchy, should someone - for some reason – want to do so.

EXAMPLE 1 A HBES IoT Information Model element *Room* can be associated directly with a Building (rather than with a Floor, as usual) semantically strongly expressed via object property “hasRoom” or semantically weakly expressed via the object property “hasSubLocation”, without violating any constraints specified by the Location model.

— Extensibility

The concept *Space* represents a generic location inside a building. Therefore, it can also be used to define types of Locations that do not fit directly into the fabric of the existing Location model classes. This can either be achieved by defining (in an extension of the current HBES Information Model) additional properties or by defining new subclasses of *Space* that are better suited for the respective purpose.

EXAMPLE 2 If it is wanted to model a wing as a part of a building, then a class *Wing* with specific wing properties may be added.

5.2 Classes and Relations

5.2.1 Introduction

This section contains a formalized description of the location model as shown in the Figure 3 below.

— The blue box denotes the topmost generic *Location*, from which all subclasses are derived.

— Green boxes denote HBES Information Model concepts that are mapped to IFC concepts with the HBES- IFC mapping ontology.

— White boxes with annotation “subClassOf” define specific (child) Location classes, white boxes without this annotation describe concepts, independent from the concept Location.

— Red dotted lines and their direction describe relationships between classes.

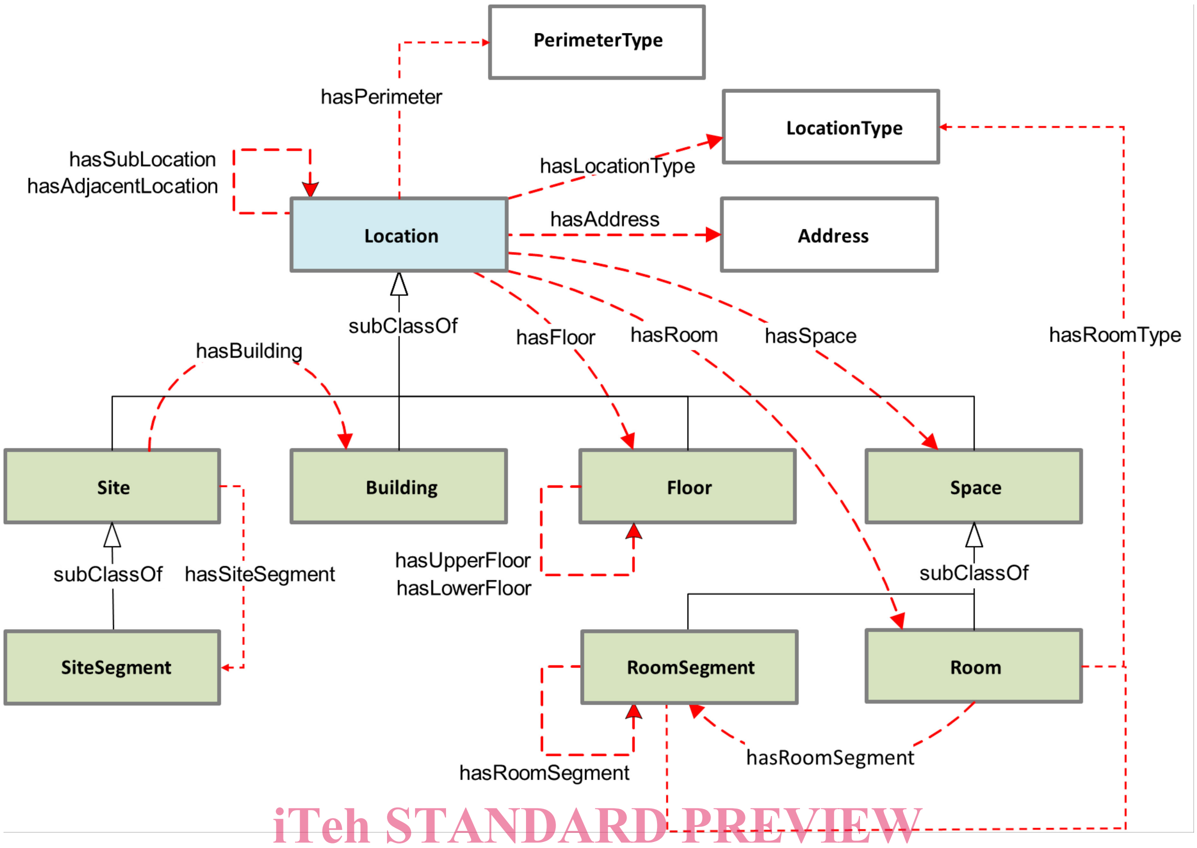

Figure 3 — Location Model

Ontology classes or their relationships have many properties. Only the main ontology classes and their main properties are described here.

Not all relationship properties (such as being "functional"), their property domain/ range and possible available inverse properties to this relationship are enumerated in the below lists. Also, if a class supports an explicit name and/or description is not mentioned hereunder.

For these details, please refer to the HBES IoT Information Model under https://schema.knxiot.org/ontology/full.

5.2.2 Classes

Table 1 — Classes of the Location Model

Class	Definition
Location	**Description** A *Location* is a physical named geographical place (such as “Lake side meeting room”, “Oskar's office”, “The 5th floor”, “Mountain view dwelling” etc.) that is used to identify a point, an area or room, inside or outside of a *Building*. **Main Properties** — *hasSubLocation* — *hasAdjacentLocation* — *hasLocationType* — *hasAddress* — *hasPerimeter* — *hasFunction* — *hasDevice* **Sub Class of** **-** **Disjoint With** — all root classes of HBES IoT Model **Notes** The class *Location* can be used as a bridging class to other ontologies (e.g. to the Point model, see Clause 1.5).
Site	**Description** A *Site* represents a collection of *Buildings* and grounds that belong to a given institution. **Main Properties** — *hasBuilding* — *hasSiteSegment* **Sub Class of** ***Location*** **Disjoint With** — Building, Floor, Space **Notes** The concept *Site* can be mapped to an IFC Site.

Class	Definition
SiteSegment	**Description** A *SiteSegment* is a part of a ground, land or of a campus. It subdivides a *Site*. **Main Properties** - **Sub Class of** ***Site*** **Disjoint With** - **Notes** The concept *SiteSegment* can be mapped to an IFC Site.
Building	**Description** A *Building* represents a whole building. A real-world building hosts several other real-world elements such as stacked floors or spaces or rooms, in ontology terms this would a *Room*, *Floor*, *Space, RoomSegment*. **Main Properties** — *hasFloor* — *hasRoom* — *hasRoomSegment* — *hasSpace* **Sub Class of** ***Location*** **Disjoint With** — Site, Floor, Space **Notes** For a Building, it might also make sense to specify a LocationType and/or an Address. The concept Building can be mapped to the IFC concept IfcBuilding.