SLOVENSKI STANDARD
SIST ENV 13154-1:2004

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Izmenjava podatkov v aplikacijah HVAC ï Omreģje med izvrģilnimi Į leni ï 1. del: Objekti

Data communication for HVAC application - Field net - Part 1: Objects

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97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

SIST ENV 13154-1:2004 **en**

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English version

Data communication for HVAC application - Field net - Part 1: Objects

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Prestandard has been prepared by Technical Committee CEN/TC 247 "Controls for mechanical building services", the secretariat of which is held by SNV.

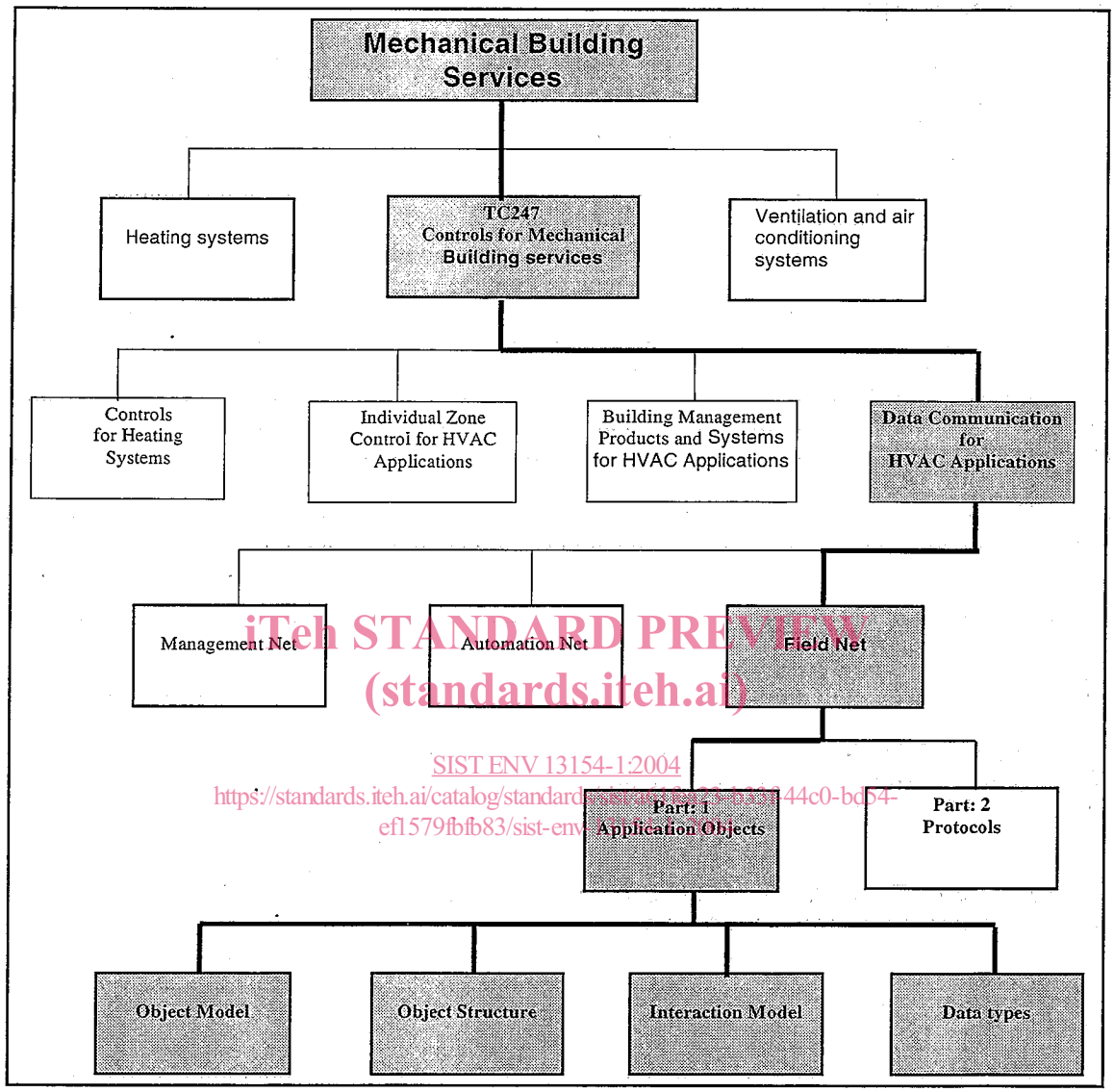

Figure 1: Structure of the standards prepared by CEN TC 247

The shaded boxes indicate the contents and hierarchy of this prestandard. The plain areas show the positioning of this prestandard with respect to other relevant mechanical building services standards.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this European Prestandard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

A number of different field level networks (FLN) are used in data communication for HVAC applications. Each of these networks has its own application layer protocol and services. Superordinate systems, which have to deal with this multitude of protocols, as well as field level end units and field level gateways, would benefit from a common set of objects and abstract services, mapped onto this variety of communication protocols.

This prestandard defines an object set which is independant of any communications protocol and is to be used for the implementation of application interfaces and gateway structures within building automation products. It is intended to be read by professional software and system design engineers.

1 Scope

This prestandard defines FLN-objects and FLN-services to be used on a field level for system neutral exchange of data for HVAC applications. This prestandard defines the semantics of the objects and the abstract services applicable to them and it defines an optional syntax to be used to exchange data with a communication front-end unit. The syntax of the object data on the underlying communication (bus) protocol is not within the scope of this prestandard.

In particular, this prestandard provides a set of objects and services which are :

- to be used by the application programmer as a unique logical interface independent of the underlying communication system. A formal application programme interface may subsequently be defined in an amendment to this prestandard if TC247 considers this appropriate.
- to be used in an interface between the HBES device and a portable communication front-end, defined as level D or as a process-interface in EN 50090-2-1
- to be incorporated and mapped by the providers of the field level protocols
    - the objects to be incorporated in the protocol provider's set of objects and to be encoded in APDUs of the respective protocol
    - the services to be mapped by the protocol providers onto appropriate services of their respective protocols

2 Normative Reference

This European Prestandard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

ENV 1805-1	Data Communication for HVAC Application Management Net - Part 1: Building Automation and Control Network (BACnet™) 1997
EN 50090-2-1	Home and Building Electronic Systems, HBES. System Overview. Architecture-
EN 50090-3-1	Home and Building Electronic Systems, HBES. Aspects of application. Introduction to the application structure.
EN 50090-3-2	Home and Building Electronic Systems, HBES. Aspects of application. The user process
IEC 60559	Binary Floating Point Arithmetic for Microprocessors (1989)
prEN ISO 16484-1:1999	Building Control Systems – Part 1: Overview and Definitions
prEN ISO 16484-2:1999	Building Control Systems – Part 2: HVAC control system functionality

3 Terms and definitions

For the purposes of this prestandard, the following terms and definitions and abbreviations apply:

ALN	Automation Level Network
APDU	Application Protocol Data Unit
API	Application Protocol Interface
ASDU	Application Protocol Service Unit
BMS	Building Management System
COV	Change of Value
COS	Change of State
FLN	Field Level Network
FLO	Field Level Objects
HVAC	Heating, Ventilation and Air-Conditioning
HBES	Home and Building Electronic System
User process	see EN 50090-2-1
Application layer	see Basic OSI-Reference-Model, EN 27498
Transport layer	see Basic OSI-Reference-Model, EN 27498
Network layer	see Basic OSI-Reference-Model, EN 27498
Media dependent layers	Those layers of a data communication system which depend on the medium chosen. Usually the physical layer and the medium access part of the link layer. (see also General OSI-Model, EN 27498)
C/S model	The c/s (client/server) model relies upon one (or multiple) client(s), requesting a distinct service from a server-application. The server-application carries out the task according to the request and, usually, returns a result to the client(s).
P/C model	In the p/c (producer / consumer) model, the producer of information offers its data to whoever it may concern. In contrast to the c/s model, there is no explicit relationship between a producer and the potential consumers of its data.
Semantics and Syntax	*Semantics* is in linguistics, the study of meanings. In computer science, the term is frequently used to differentiate the meaning of an instruction from its format. The format, which covers the spelling of language components and the rules controlling how components are combined, is called the language's syntax. For example, if you misspell a command, it is a syntax error. If, on the other hand, you enter a legal command that does not make any sense in the current context, it is a semantic error.Source: http://webopedia.internet.com/
Superordinate	A superordinate BA-system or BA-controller is a system or controller residing in a higher level of the BA-system as defined in the "Generic Structure of Building Control and Automation Systems" in prEN ISO 16484-1:1999
Unsolicited message	In data communication this is a message that is spontaneously transmitted from a server to clients, without a preceeding request from the client.

4 General Requirements

4.1 System Overview

The application model, in which the field level objects defined in this prestandard shall be embedded, is that of EN 50090-2-1.

4.2 Aspects of Application

An overview of the object embedding structure of the HBES to be used on the fieldnet level of building management products and systems for HVAC applications is defined in EN 50090-3-1.

The model of the user process of the HBES to be used on the fieldnet level of building management products and systems for HVAC applications is defined in EN 50090-3-2.

The objects and services defined in this prestandard are part of the HBES device application process. More specifically, the network-visible parts of the FLN-objects are part of the user element, while the shared context is part of the HBES user process. The shared context is that part of the FLN-object, which has to be known by certain classes of clients but which is not necessarily accessible through the FLN.

The FLN-services defined in this prestandard are part of the user element. For network communication, the FLN-services are mapped onto appropriate services of the underlying communication system. The FLN-objects are exchanged by means of the underlying communication network, converting the syntax but not changing the semantics of the FLN-objects.

4.3 Object Model

The object model defined here is an elaboration of the models provided in EN 50090-2-1 and in EN 50090-3-1. This elaboration deals with the fieldnet level for system neutral exchange of data for HVAC applications.

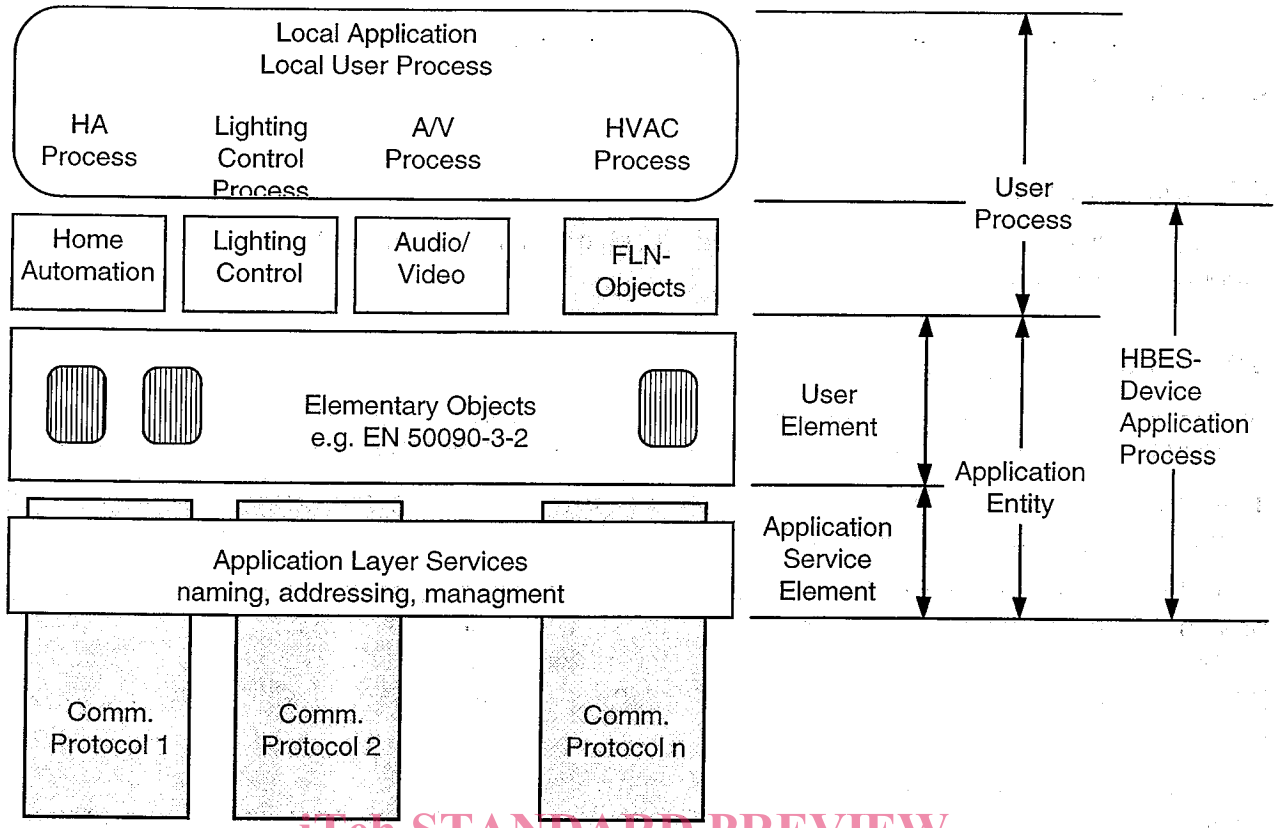

Figure 2: Application process structure, showing the embedding of the FLN-objects

This prestandard deals with the FLN objects shown in the shaded area in Figure 2. The idea of this model is that a variety of communication protocols are mapped onto one unique object layer. This occurs at the user element of the application entity. This object layer can then be specialised to support different families of applications. The present prestandard elaborates this view to enable control of HVAC processes as part of the whole Building Management System.

EN 50090-2-1 defines a distributed HBES Application Process. In this prestandard, this view is extended to serve the needs of Building Management Systems. There is a difference between

- process communication, which provides for the exchange of data between distributed field level processes
- management communication which provides for the interactions between a field level process and a building management application or supervisory application.
    - operating (operator to process)
    - alarming (process to operator)
    - data acquisition
    - process co-ordination (by superordinate building management controller)
- Engineering communication which provides for interactions between a field level process and engineering-related processes in a commissioning- or service-tool:
    - Application process engineering
    - Fault diagnostics
    - Commissioning

These lists of applications for these three types of interactions are not exhaustive.

The figure below shows the different needs of the users of these three types of applications:

- The peer HVAC process needs to be updated about the current value of the linked datapoint

- The end user and the BMS engineer, representing operator- and job engineering needs respectively, also need to access the additional properties of the object.

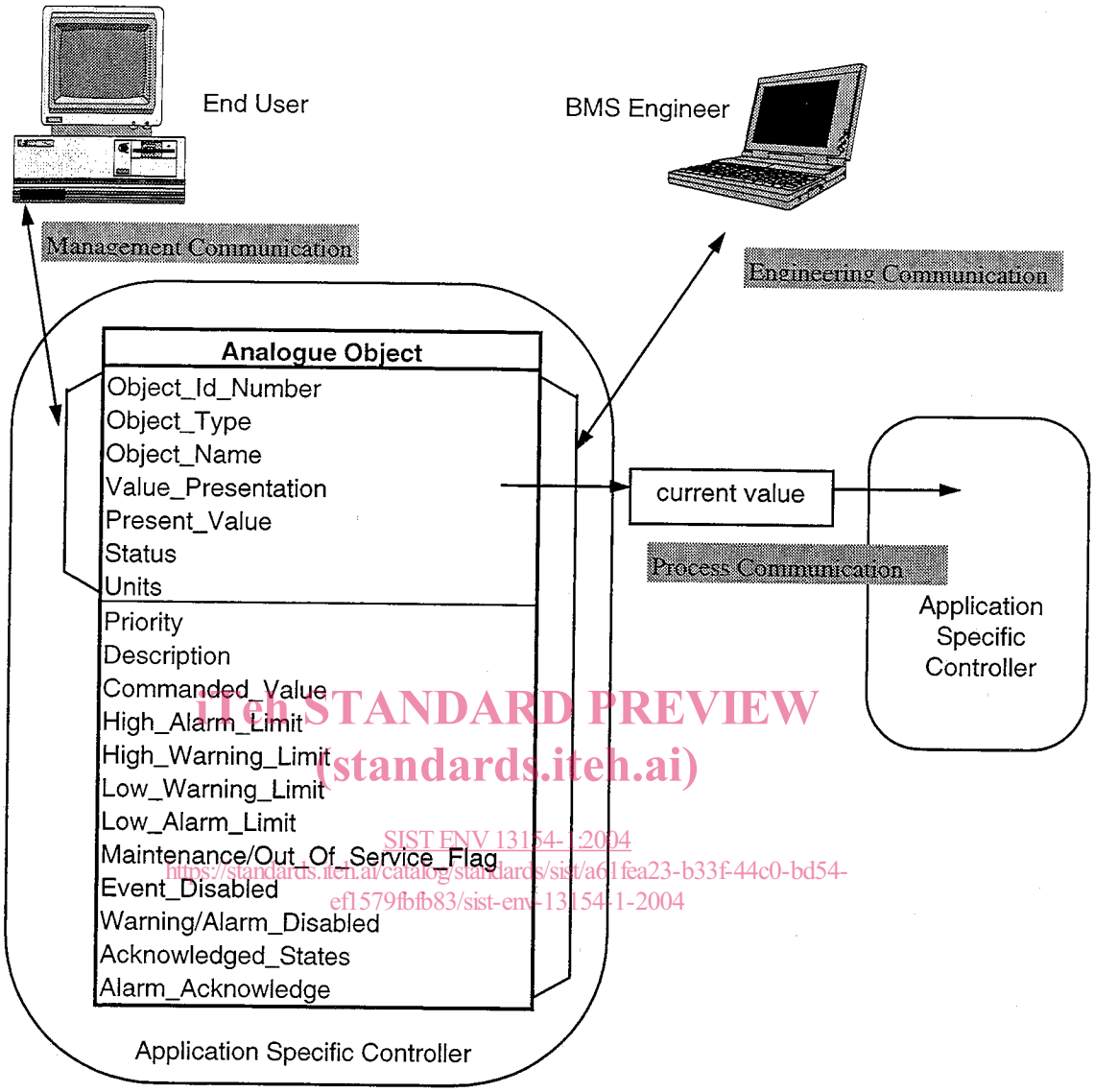

Figure 3: BMS communication types

4.4 Object Structure

The objects defined consist of three types of properties:

- mandatory properties which are be defined and accessible in a standardised manner through the network
- optional properties may be defined and, if defined, may be accessible in a standardised manner through the network
- engineerable properties may be defined, but are not accessible in a standardised manner through the network

Whether optional properties are defined and accessible by the means defined in this prestandard and whether the engineerable properties are defined is an implementation-specific matter and outside the scope of this prestandard.

In line with the intended usage of this prestandard, the definitions are expressed in terms of an abstract layer, rather than a communication protocol physically exchanging data. Therefore there are no assumptions as to where and how the objects and their properties are stored and managed within the system. Only the accessibility within the abstract layer is defined.

4.5 Interaction Model

For management communication purposes, field level devices are modelled as servers and management devices as clients. Inter process communication may use either the producer-consumer model or the client server model.. Management-, engineering- and process-communication have different requirements for interaction with the objects in a server.

Note: A clear distinction is made between two kinds of application layer mechanisms and services: those related to the communication model (e.g. binding methods and context exchange methods) and which are often handled by the so called Application Control Services and those related to the application process (e.g. COV-exchange, alarming..) which are usually handled by services specific to a certain field of application, e.g. process control. This prestandard defines the latter mechanisms and the semantics of the related services. The former mechanisms and services are specific to the particular communication systems handling the objects defined in this prestandard.

This prestandard defines a minimum set of abstract services:

- ReadProperty-service reads a property of an object-instance. The read service is used by management communication for one-time reading of any property of any object available within the „abstract layer“. It may also be used to poll for properties in a repetitive manner. The read service may be used by engineering communication to create or update the engineering database.
- WriteProperty service writes a property of an object instance. The write service is used by the management communication to command objects and change parameters and, by engineering communication, to set-up or change parameter-values in a server device.
- COVNotification service spontaneously offers the value of a server object's property to a peer entity or client. The notification service is used by a server to inform its peer process-devices or superordinate clients about changes of values or states of certain properties of an object.
- AlarmNotification service spontaneously offers alarm-state related information to clients. This service may be used to inform superordinate clients about an alarm condition in the server's HVAC-process.

The fact that a property is mandatory does not require that, during communication, all of these properties have to be part of the PDU (Protocol Data Unit). In most cases only Object_ID_Number and value will be transmitted. The decision was made to use 8 bit boundaries.

5 The Field Level Objects

This section describes the properties of the following object types:

- analogue object
- binary object
- counter object
- device object
- loop object
- multistate object

The object properties and, in some cases, the encoding of the object elements is very close to ENV 1805-1: Data Communication for HVAC Application Management Net - Part 1: Building Automation and Control Network (BACnet^{TM}) 1997

For definition and examples of objects see prEN ISO 16484-2:1999

In the following sections, the characters R and W are defined as meaning :

- R - the object element is read only in normal operation.
- W - the object element is both readable and writeable in normal operation.

"Normal operation" excludes commissioning, installation and maintaining phases.

Each property has is own property identifier. Hence every property can be read or, if possible, written. All optional properties are collected in an unique list, so each optional property has its own unique number, or identifier, and new optional properties can be added. The optional property list is part of this definition and may be subject to modification by TC247.

Dimensions are split into two groups, one for the analogue objects (Unit) and another for digital objects (Statetext). For each there is a list containing all the Units and Statetexts commonly used and which may be extended in the future, if required.

The default value of the Acknowledged-States property is "*normal*".

Events are related to both process-oriented and management-oriented communication, alarms are related only to management-oriented communication.

The COV_Enabled and Alarm_Enabled properties contain the enabled information and the destination Object_ID_Number, i.e. the identity of the object sending the information "write COV_-Enabled" or "write Alarm_Enabled".

5.1 Device Object

The Device Object is used for status information about a field device. If the Device Object receives an Alarm_Enabled or an COV_Enabled message all objects of the Common_Object_List are directly enabled or disabled, depending on the message, and not by means of the alarm/event server process.

If the Alarm_Enabled or COV_Enabled property is reset (0) then all alarms or events of the objects located in this device are disabled. If the Alarm_Enabled or COV_Enabled property is set (1) the alarm state or event state is compared with the Acknowledged_States property and, if they are different, the corresponding action is started.