BRITISH STANDARD

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Home and Building Electronic Systems (HBES)

Part 2-1: System overview — Architecture

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Contents

National foreword

This Part of EN 50090 has been prepared by Subcommittee IST/6/10 and is the English language version of EN 50090-2-1 : 1995 *Home and Building Electronic Systems (HBES) Part 2-1 : System overview — Architecture,* published by the European Committee for Electrotechnical Standardization (CENELEC).

This British Standard is published under the direction of the Information Systems Technology Assembly whose Technical Committee IST/6 has given its Subcommittee IST/6/10 the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

NOTE 1. This British Standard is a direct transposition of a European Standard produced under the direction of CENELEC TC205, Home and Building Electronic Systems, and represents a majority view of the subject at the time that the text of the standard was sent for ballot. The subject of Home and Building Electronic Systems is an area of fast moving technology as are the closely related areas of information technology and communication engineering. Prospective users of this standard are therefore urged to enquire as to the current state of standardization in CENELEC TC205 before placing reliance on the content of this standard.

Cross-references

Reference is made to EN 27498 : 1989 which is now withdrawn, and has been replaced by EN ISO IEC 7498-1 : 1995. The corresponding British Standard is BS EN ISO/IEC 7498-1 : 1995.

NOTE 2. International and European Standards, as well as overseas standards, are available from Customer Services, BSI, 389 Chiswick High Road, London, W4 4AL.

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EUROPEAN STANDARD

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Descriptors: Home and building electronic systems (HBES), home electronic systems, definitions, open systems interconnection (OSI), OSI reference model, HBES reference model, HBES topology, specifications

English version

Home and Building Electronic Systems (HBES) Part 2-1 : System overview — Architecture

Systèmes électroniques pour les foyers domestiques et les bâtiments (HBES)
Partie 2-1 : Vue d'ensemble du système Architecture

Elektrische Systemtechnik für Heim und Gebäude (ESHG)
Teil 2-1 : Systemübersicht Architektur

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Ref. No. EN 50090-2-1 : 1994 E

Foreword

This European Standard has been prepared by CENELEC TC 105, Home and Building Electronic Systems (HBES). It was submitted to the unique acceptance procedure and was approved by CENELEC as EN 50090-2-1 on 1993-12-08.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-12-01
- latest date of withdrawal of conflicting national standards (dow) 1994-12-01

EN 50090-2-1 is Part of the EN 50090 series of European Standards, which will comprise the following Parts:

Part 1: *Standardization structure*

Part 2: *System overview*

Part 3: *Aspects of application*

Part 4: *Transport layer and network layer*

Part 5: *Media and media dependant layers*

Part 6: *Interfaces*

Part 7: *System management*

EN 50090-2-1 uses the concepts and definitions given in EN 50090-1 (in preparation) and is partly based on the work of ISO/IEC JTC1/SC25. It takes into account the CENELEC Technical Report R105-001 : 1992, *Applications and requirements – Class 1.*

Contents

1 Scope

This European Standard specifies the general features and architecture of the HBES.

The object is:

- to define new terms for use in the EN 50090 series;
- to give general information and advice on the required HBES features and its architecture;
- to specify the HBES model;
- to specify the basic functional structure of an HBES with its reference points and interfaces.

2 Normative references

This European Standard 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 Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 27498 — *Information processing systems — Open Systems interconnection — Basic Reference Model (ISO 7498 : 1984 + A1 : 1987).*

3 Definitions

For the purpose of this standard the following definitions apply. Note that the definitions given in EN 50090-1[1] also apply to this standard.

3.1 Definitions from EN 27498

The following terms defined in EN 27498 apply to this standard:

application entity
application process
application service element, ASE
connection-mode communication
connectionless-mode communication
data-link-service-data-unit
flow control
network service data unit, (N)-SDU
OSI environment, OSIE
segmenting
user element
service access point

3.2 Additional definitions

For the purpose of this standard the following definitions apply in addition:

3.2.1 *domain*

Range of validity.

NOTE. When the term is used for a more specific concept, it should be qualified. Examples are application domain (the range including OSI layer seven and above), user domain (the range above OSI layer seven).

3.2.2 *topology*

The structure of the communication paths between the medium attachment points.

NOTE. Examples of topologies are: bus, ring, star, tree.

3.2.3 *repeater*

A unit that regenerates or amplifies signals in order to extend the range of transmission between medium attachment points or to interconnect two network segments that use the same protocols.

3.2.4 *HBES-application*

Field of use of an HBES.

NOTE. An HBES may support more than one application.

3.2.5 *HBES-object*

Set of data with associated functions applicable to it.

NOTE. An HBES-object can be implemented in various ways.

3.2.6 *HBES application object*

An HBES application object is an HBES-object located within the HBES device application process.

3.2.7 *device application process*

An element within a device which performs information processing for a particular application. It can represent a manual, automated, computerized or physical process.

3.2.8 *HBES device application process*

That part of a device application process which is accessible through the HBES communication network.

NOTE 1. An HBES device application process is built up with application objects.

NOTE 2. The functionality of the HBES device application process is defined in this series of standards or in the appropriate product standards.

3.2.9 *user process*

That part of a device application process belonging to the real system environment, that is the user domain.

3.2.10 *HBES user process*

That part of the HBES device application process belonging to the user domain of the HBES.

3.2.11 *local application process*

That part of an application process within a device which is not accessible through the HBES communication network. It is located inside the user domain.

3.2.12 *connection*

An association established between functional units for data transmission across a network (or part of a network) for the purpose of communication between the units. The association is explicitly established at some point in time, and exists until explicitly ended.

NOTE. Data transmission includes, in this context, audio, video and other information in either analogue or digital form.

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[1] EN 50090-1 will provide for an overview of the complete series EN 50090 and will be published later. Currently it is a draft.

3.2.13 ***control channel***
A communication channel that is established between two or more entities for the primary purpose of exchange of HBES control and monitoring messages.

3.2.14 ***information channel***
A communication channel that is established between two or more entities for the primary purpose of exchange of information other than HBES control and monitoring messages.
NOTE. Examples of such information are audio or video data, facsimile data and analogue speech signals.

3.2.15 ***circuit-switching transmission***
Transmission using a channel that offers a continuous communication path, or time-multiplexed communication with fixed time slots having a constant communication bandwidth.

3.2.16 ***packet-switching transmission***
Transmission that uses communication bandwidth in bursts. An entity transmitting data using packet-switching transmission organizes the data in discrete 'packets'. Typically, two or more entities using packet-switching transmission share a communication channel. A protocol is required to resolve contention between transmitting entities to allow the orderly interleaving of packets from different entities.

3.2.17 ***network segment***
A part of an HBES network that is within the domain of a single link layer instance.

3.2.18 ***unit***
Piece of equipment.

3.2.19 ***network access unit (NAU)***
Piece of equipment which comprises the mechanical, electrical and communicational functions for an HBES connection. The NAU corresponds to one network service access point (NSAP) and can be uniquely identified by one or more network addresses.

3.2.20 ***transmission medium***
A physical medium that conveys signals.
NOTE. Often referred to as just medium.

4 HBES reference model

The HBES shall be designed in accordance with the OSI reference model (OSI/RM). The functionality of the OSI/RM is very general, and not all of this functionality is needed in the HBES reference model (HBES/RM). For this reason, also for reasons of protocol efficiency, some of the layers defined in the OSI/RM are null in typical implementations of HBES. In particular, some implementations have little or no functionality at one or more of the layers: Network, Transport, Session and Presentation Layer. If a layer has no functionality of its own, then it is regarded as present, merely to map between the layer below and the layer above. This imposes no overhead on any implementation. Figure 1 depicts the overall structure of the HBES/RM. The power feed service is not shown in this figure. Layers between Data Link- and Application Layer may be null in some systems.
NOTE. The control channel and information channel(s) may be on the same or different media (which may be of different types).

In some implementations all layers are contained within one piece of equipment. It is also possible to split the implementation across two (or more) pieces of equipment. To facilitate this, standardized interfaces are defined in later parts of this standard. The three standardized interface points are the medium interface, the universal interface (between Network and Transport Layer) and the process interface (above Application Layer). These are explained in clause **5**.

The overall HBES/RM consists of three parts:

- communication;
- application;
- management.

These will be described below.

4.1 Communication

The HBES/RM defines layers which correspond to the general OSI reference model and in addition a management function.

In the HBES/RM a distinction is made between information and control channels. These channels are distinguished from an application point of view. For the control channel each layer identified within the communication part of the HBES/RM has a standardized functionality, whereas for information channels only the Physical Layer may have a standardized functionality. The control channel uses packet switching, whereas the information channel typically uses circuit switching.

Packet switching and circuit switching are communication services. HBES shall also offer a power feed service, from which units may draw their supply current.

HBES is a multimedia system in the sense that it may use one or more transmission media. Since different transmission media have different characteristics, the Physical Layer and Data Link Layer services can be distinct for optimization for different media. Above the Data Link Layer the services provided are medium independent. The performance characteristics may differ according to the medium used. For instance, the transfer capacity of power line is less than that of twisted pair.

The control channel is fundamental for the HBES and shall be realized by packet switching.

This subclause gives an overview of the functions of each layer. Other parts of the EN 50090 series will define the layers in more detail.

4.1.1 *Physical Layer*

The Physical Layer provides mechanical, electrical, functional and procedural means for physical communication between data link entities. A network may contain repeaters. Physical Layer entities are interconnected by means of a physical medium.

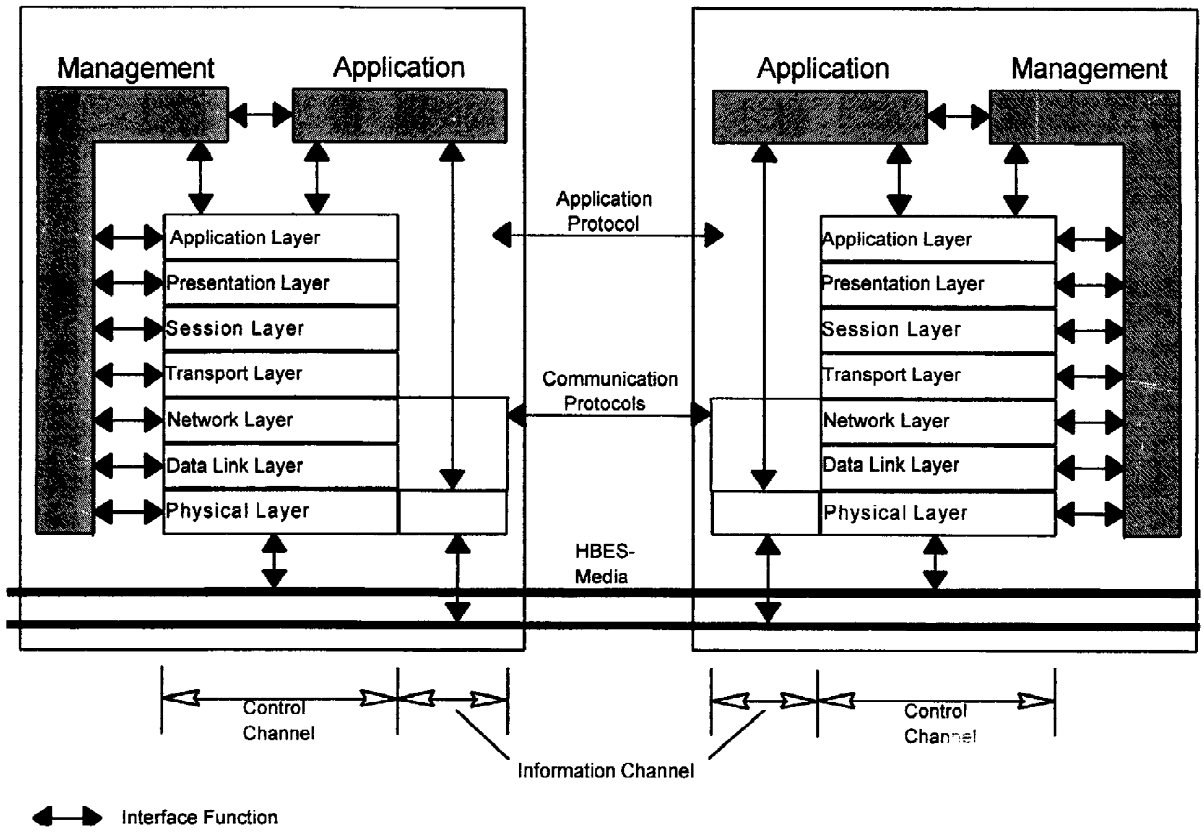

Figure 1. Overview of the Home and Building Electronic System Reference Model

The Physical Layer may offer two modes of service. The control channel provides packet switching. Information channels provide circuit switching. Every information channel shall have an associated control channel to manage it (though the same control channel may manage several information channels). Not all Home and Building Electronic Systems media offer information channels. All Home and Building Electronic Systems shall at least offer one HBES control channel.

4.1.2 *Data Link Layer*

The Data Link Layer provides functional and procedural means for connectionless-mode service. It transfers information between network entities and optionally establishes, maintains and releases data link connections among network entities. A data link connection uses one or more physical connections. It is expected that all Data Link Layer implementations will be connectionless.

The Data Link Layer shall detect errors and shall offer error correction functionality. Uncorrected errors may be reported to the Network Layer. The Data Link Layer provides the means to access the medium, handling when necessary contention for access.

The Data Link Layer may also implement flow control to manage the rate of information transfer and sequence numbering to manage the ordering of data link service data units.

The Data Link Layer shall provide recognition of data link addresses, and may provide to the Network Layer confirmation of the success or non success of services requested by the Network Layer.

A Data Link Layer implementation may make use of bridges to link transparently several data links in tandem to provide a data link service.

4.1.3 *Network Layer*

The Network Layer provides the functional and procedural means for connectionless-mode or connection-mode service. It gives the transport entities independence of the route and of the topology of the network segment. This includes the case where several network segments are used in tandem or in parallel.

It makes invisible to transport entities how underlying resources such as data link connections are used to provide network services. The Network Layer may provide notification to the Transport Layer of errors which have been reported by the Data Link Layer, and also of protocol errors which may occur in the Network Layer.

The Network Layer may also implement flow control to manage the rate of information transfer and sequence numbering to control the ordering of network service data units.

The Network Layer shall provide recognition of network addresses, and may provide to the Transport Layer confirmation of the success or non success of services requested by the Transport Layer.

The Network Layer services are optional.

4.1.4 *Transport Layer*

The Transport Layer provides transparent transfer of data between session layer entities and relieves them from any concern with the detailed way in which reliable transfer of data is achieved.

All protocols defined in the Transport Layer have end-to-end significance, they are carried transparently across the network.

The dual purposes of Transport Layer is:

- to provide a connection-mode transport service over the connectionless network service;
- to provide data segmentation.

The Transport Layer services are optional.

4.1.5 *Session Layer*

In the HBES the Session Layer has null functionality.

4.1.6 *Presentation Layer*

In the HBES the Presentation Layer has null functionality.

4.1.7 *Application Layer*

The Application Layer provides a means for the HBES device application processes to access the HBES communication resources. Each HBES device application process is represented to its peer by the application entity. The application entity contains one user element and a set of application service elements. The application service elements may call upon each other and on the presentation services to perform their function.

4.1.8 *Medium aspects*

A medium may be open either allowing free propagation of electromagnetic waves, or guided by for example an electrical conductor, wave guide or optical fibre. The following media have been identified for HBES use:

– twisted pair	(TP)
– power line	(PL)
– coax	(CX)
– infra-red	(IR)
– radio frequency	(RF)
– optical fibre	(FO)

But this list is not exclusive. Physical characteristics will be defined in EN 50090-5 (Media dependent layers). That Part will cover aspects such as installation, regulatory factors, topology, distances and signal confinement, connectors and EMC.

Twisted pair and power line shall provide a power feed service, which allows devices to draw power supply current from the medium. For other appropriate media the power feed service is optional. The specification of each medium will define the power feed service (if available).

4.2 Application

One of the main characteristics of an HBES is that most of its application processes are distributed. This is shown in figure 2 for only one application process to keep the figure simple. Of course devices may belong to more than one application process.

The application process, the structure of which is shown in figure 3, consists of the HBES device application process and an optional local application process. The part belonging to the real system environment (RSE, that is the user domain) is named user process. A user process may consist of user

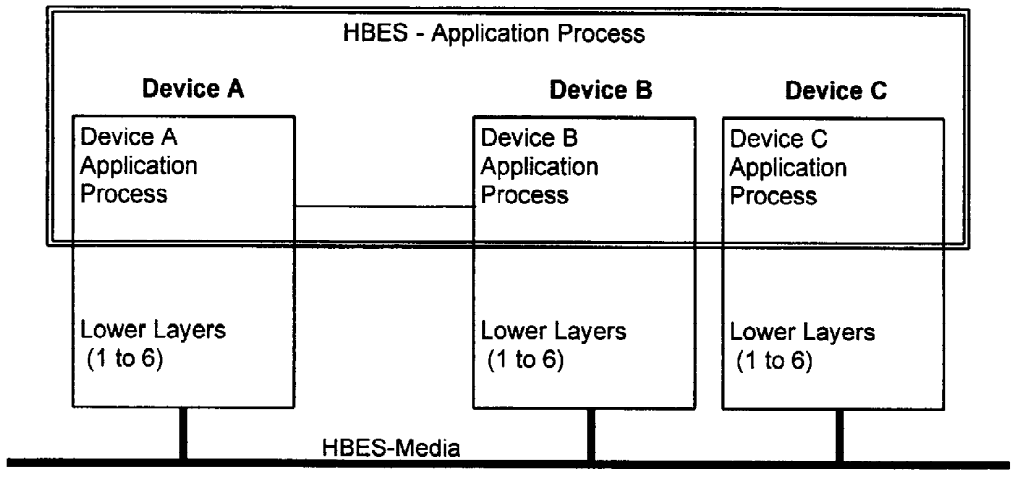

Figure 2. Application process of an HBES

programmes, physical processes or user interactions. The HBES device application process only partly belongs to the OSI environment (OSIE). This part is the Application Layer. The other part belonging to the RSE is named HBES user process. That means user process and application process are overlapping each other. The RSE interfaces to the OSIE via the user element which is located inside the Application Layer.

As shown in figure 4 the HBES device application process is constructed of application objects. The user element and the associated application service elements (ASE) allow the HBES-user process to communicate via the HBES communication system (see figure 5). An HBES-user process may use more than one application service element for this communication.

4.3 Management

The management aspects of the HBES concern the problems of initiating, testing, terminating, and monitoring the HBES activities and assisting in their harmonious operations, as well as handling abnormal conditions. Typical management activities are:

a) activation/deactivation:
   1) activation, maintenance, and termination;
   2) parameter initialization and modification;

b) monitoring:
   1) status and status change registration;
   2) statistics registration and reporting;

c) error control:
   1) error detection;
   2) diagnostic functions;
   3) reconfiguration and restart.

From a functional point of view the management aspects of the HBES can be divided into two main parts:

a) SYSTEM MANAGEMENT, concerned with management of communication resources;

b) APPLICATION MANAGEMENT, concerned with management of application processes.

4.3.1 *System management*

The system management entity (SME) is in charge of the management of communication resources.

Inside this system management, layer management entities (LMEs) interface to each layer.

Examples of system management entity (SME) activities are given in tables 1 and 2:

Table 1. Layer Management functions

Activity	Example
1.1	Control of (N)-layer operation(s) (enable/disable/reset/etc.)
1.2	Modification of parameters general for a specific type of (N)-layer operation
2.1	Registration of status of (N)-layer operation(s): reporting to SME
2.2	Quality of (N)-layer operation(s) (number of successful transmissions per time-unit)
3.1	(N)-layer operation(s) error detection to identify the demand for error control
3.2	(N)-layer operation(s) error diagnostics to identify needed error control activities
3.3	(N)-layer operation(s) reset

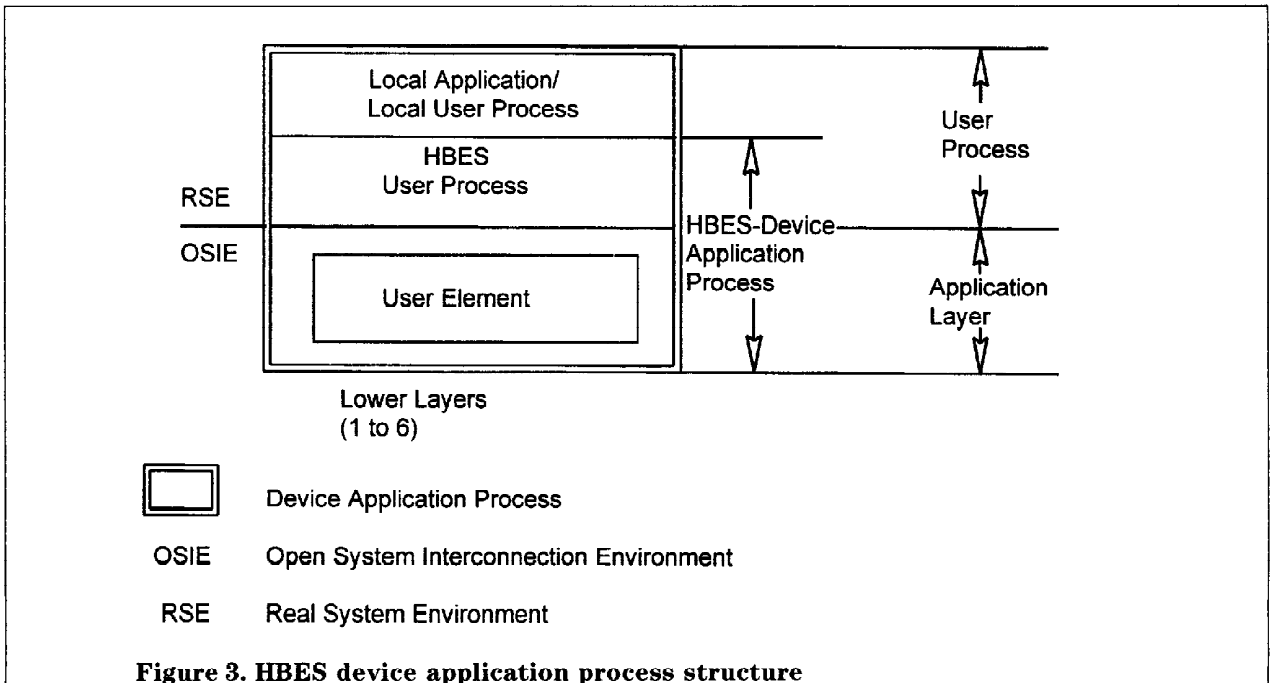

Figure 3. HBES device application process structure

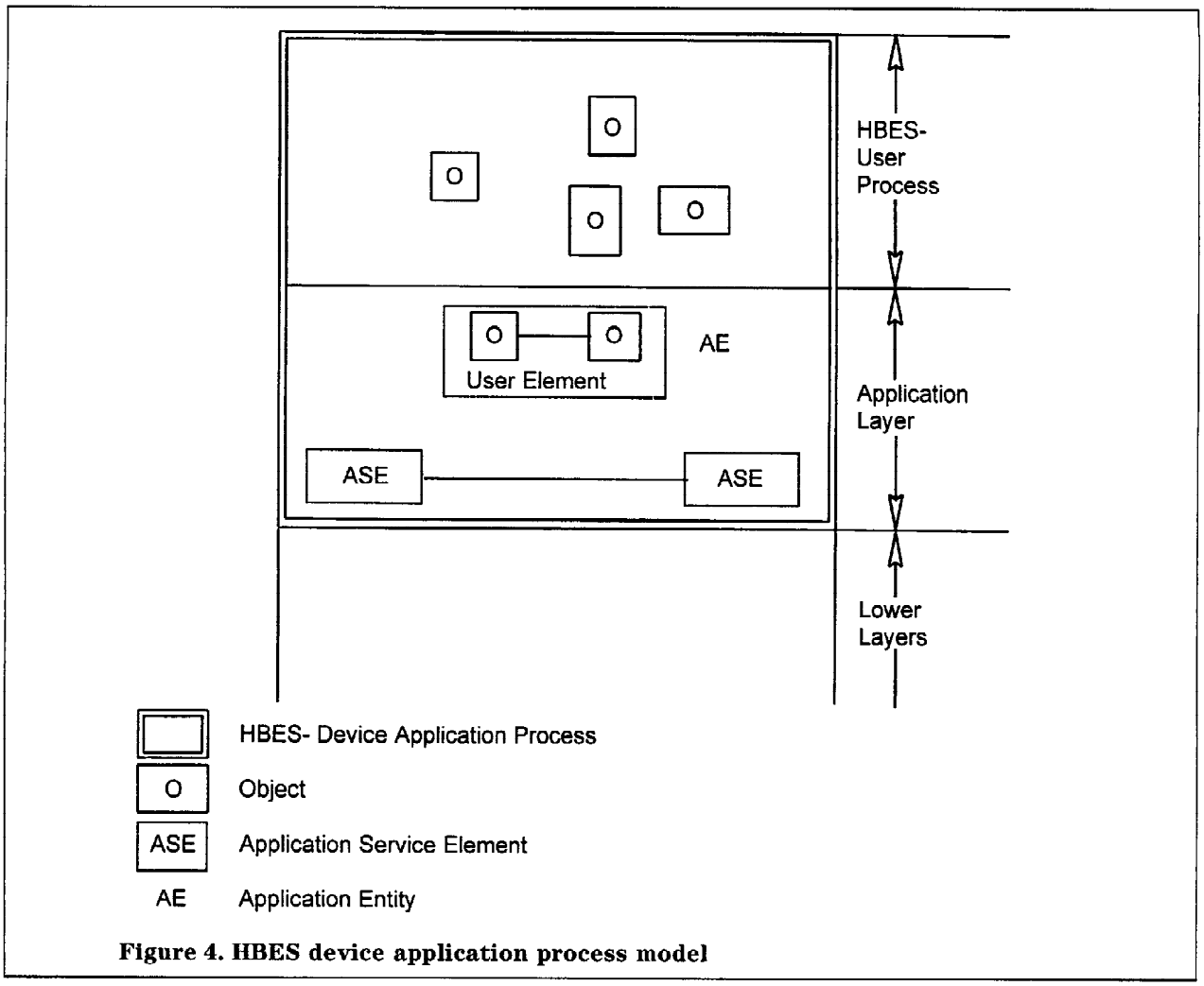

Figure 4. HBES device application process model

Table 2. General Management functions	
Activity	**Example**
1.1	Set mode of operation (normal/test/maintenance/etc.) for single device/group of devices/whole system
1.2	Initialization and modification of system parameters (communication relations)
2.1	Status of single device/group of devices/whole system; remote error indication to user
2.2	Registration and reporting of performance for single device/group of devices/whole system
3.1	Single device/group of devices/whole system error detection to identify the demand for error control
3.2	Single device/group of devices/whole system error diagnostics to identify needed control activities
3.3	Single device/group of devices/whole system reset

The general management structure of communication resources for a device is illustrated in figure 6.

The SME uses the services available on the layer 7 service boundary.

The user (which may be a human) of the communication resources interfaces to the user process as well as to the system management. The user may also provide some system wide management capability. This is illustrated in figure 7.

The management of the communication resources by the layer management entities (LMEs) is strictly a layer function. LMEs do not have direct human or user access.

All HBES devices shall have a defined minimum functionality of the SME.

One or more devices may have additional management functionality to assist a human user.

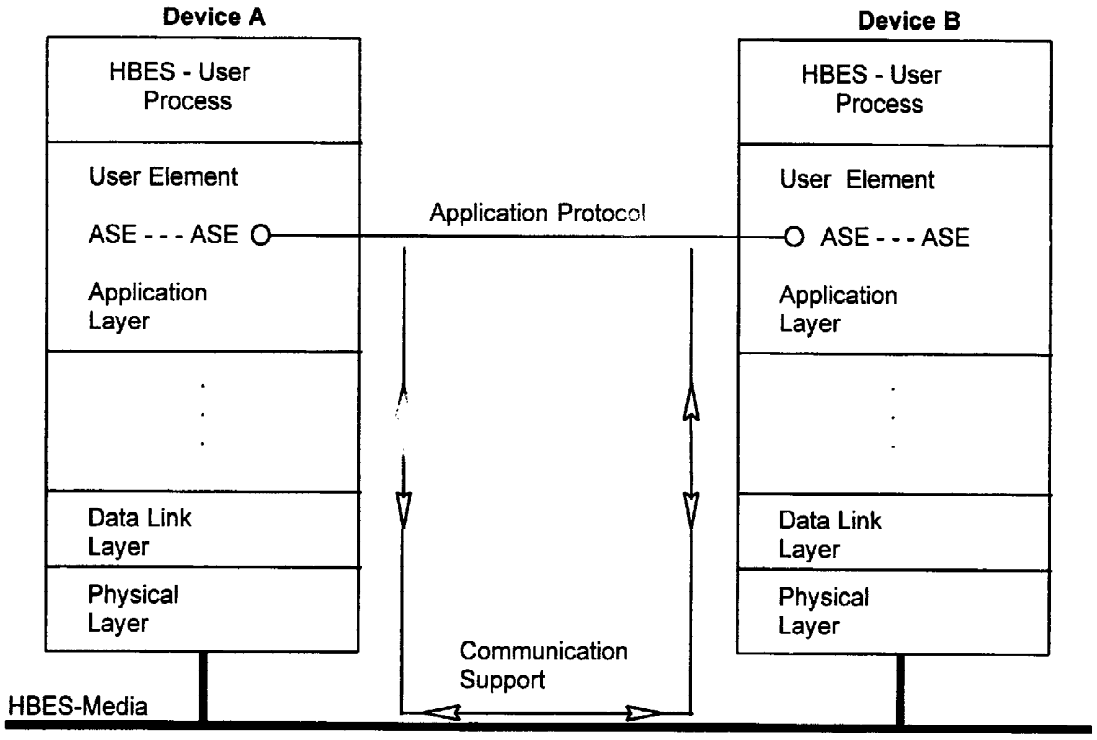

Figure 5. Link of user processes

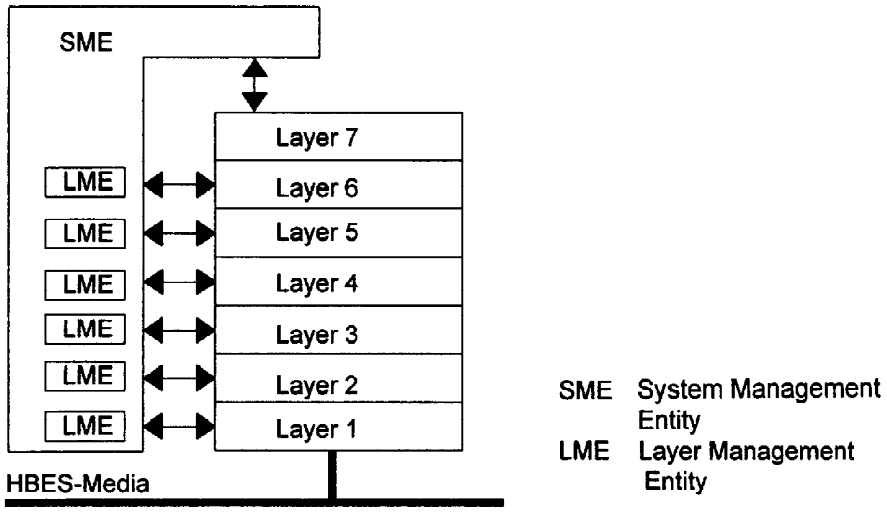

Figure 6. Management of communication resources

This HBES specification allows implementations in such a way that the lower layers are implemented in a Network Access Unit (NAU) separate from the upper layers. This is particularly related to the Universal Interface (UI) defined in EN 50090-6-1. In such a case the lower layer unit needs functionalities of the upper layers as well as reduced HBES/SME functionality for its own management. Figure 8 shows an example where the UI is placed between layer 3 and 4.

NOTE. EN 50090-6-1 is still under consideration.

4.3.2 *Application management*

Management of the application processes is responsible for managing priority conflicts and synchronization between application processes, including proper initiation, monitoring and termination of application processes. For this purpose an application management entity (AME) is defined.

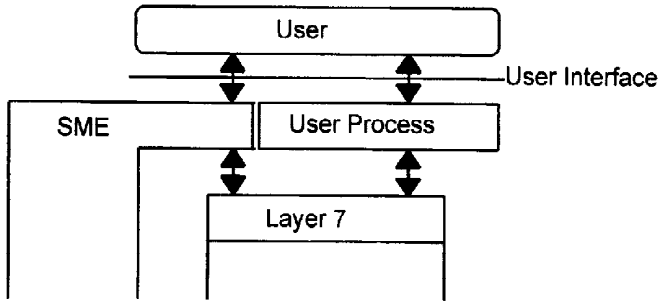

Figure 7. User interface of the communication resources

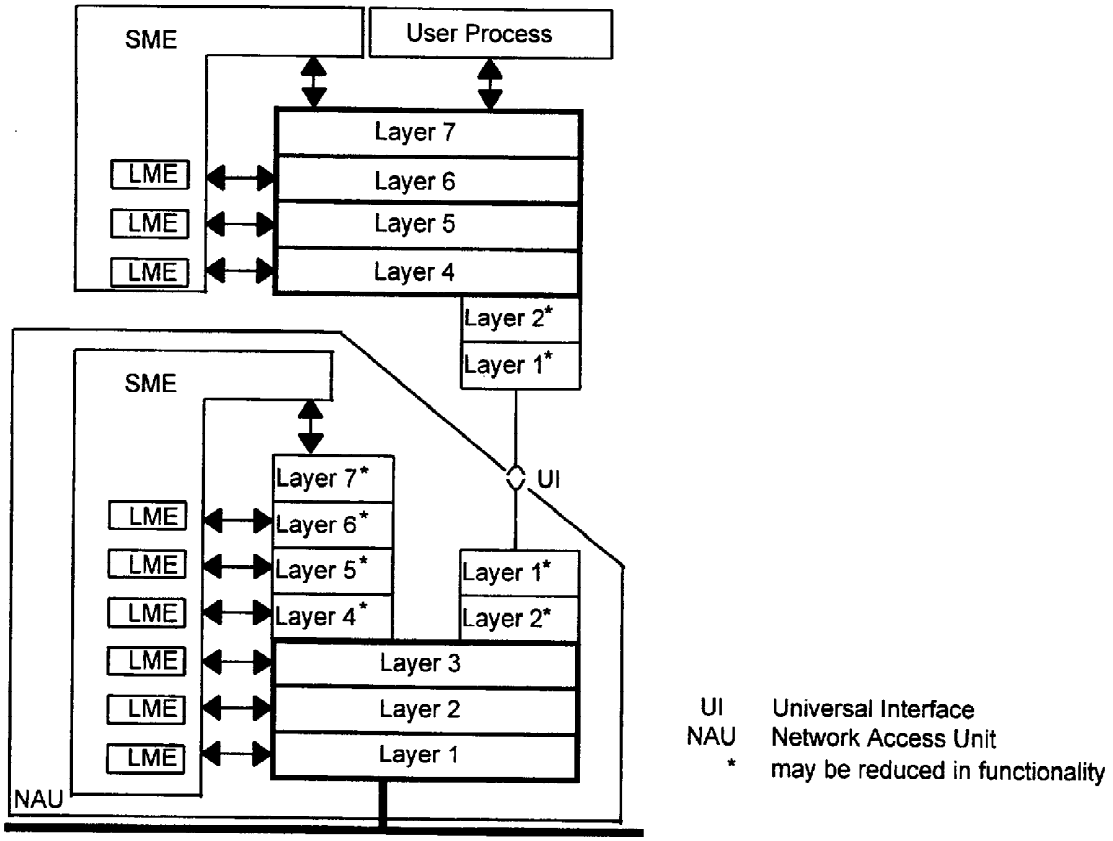

Figure 8. Example of management functions of a device using the universal interface

Table 3. Examples of application management entity (AME) functions	
Activity	**Example**
1.1	Control of application process operation
1.2	Initialization and modification of application process parameter(s)
2.1	Status of application process operation(s)
2.2	Registration and reporting of application process performance
3.1	Application process operation(s) error detection to identify the demand for error control
3.2	Application process operation(s) error diagnostics to identify needed control activities
3.3	Application process operation(s) reset

The general management structure of an HBES device application process is illustrated in figure 9. The device application process may use the control channel (7 OSI layers) as well as one or more information channels (at least OSI layer 1).

The user of the application process resources interfaces to the AME as well as to the application process. The user may also provide some system wide management capability. This is illustrated in figure 10.

All HBES devices shall have a defined minimum functionality of the AME.

One or more devices may have additional management functionality to assist a user.

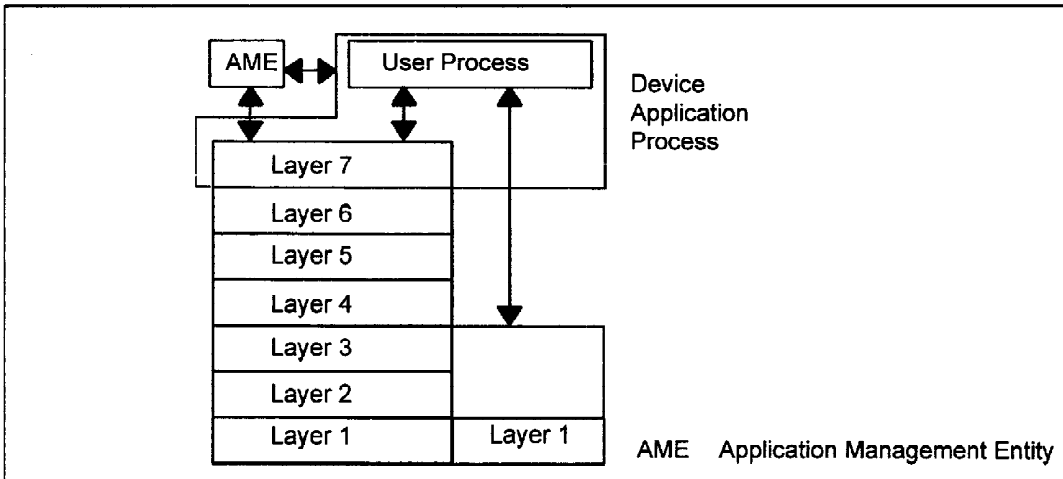

Figure 9. Management of application process

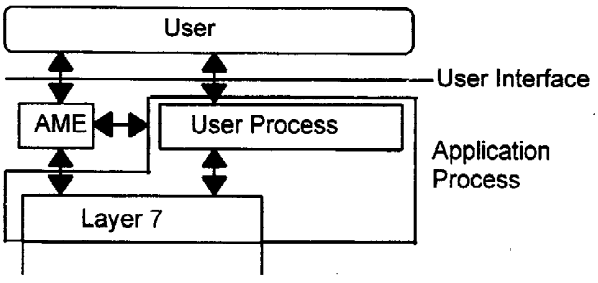

Figure 10. User interface of the application process resources

5 Reference points and functional groupings

5.1 General concept

A Home and Building Electronic System can be seen as a set of elementary components (such as pieces of equipment, software programs), each of them implementing one or more particular functions, and interworking with its neighbours through interface points. These elementary components are called 'functional groupings'. The boundaries between these functional groupings are called 'reference points' (see figure 11). Note that the term 'functional grouping' has a different meaning than the term 'grouping' used in **7.3**.

This model does not depend on any hardware or software implementation and it is not necessary or normal that every reference point be present as an interface in an HBES implementation.

The subdivision of functions into functional groupings provides a basis for defining stable interfaces for connecting different parts of the system.

A functional grouping may offer one or more implementations of reference points, each of which may face towards or away from the network medium. If there are two or more implementations of reference points facing the same direction, they need not be the same reference point.

For example, figure 12 shows a functional grouping with one implementation of a reference point facing towards the network medium and three implementations of reference points facing away from the network medium.

Similarly there might be multiple instances of the lower reference point. Multiplexers and gateways are examples of such functional groupings (see figure 13).

Figure 13 shows a functional grouping with three implementations of reference points facing towards the network medium and one implementation of a reference point facing away from the network medium.

Depending on the information flow the function of the implementations according to figure 12 or figure 13 is multiplexing or demultiplexing.

Figure 14 shows a functional grouping with two implementations of reference points facing towards possibly dissimilar network medium and no reference point facing away from the network medium. An example of such a functional grouping may be a gateway between different network segments (medium A, medium B).

5.2 Specific reference points and functional groupings

The following set of reference points is defined:

A: medium attachment point;

B: home network access point, medium independent but network dependent;

C: home network access point, medium independent, network independent and device independent;

D: user process access point;

E: external network access point.

The hierarchy of reference points for HBES is shown in figure 15.

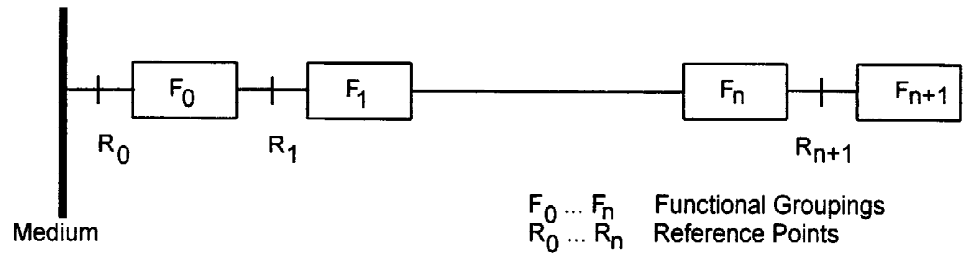

Figure 11. Reference points and functional groupings

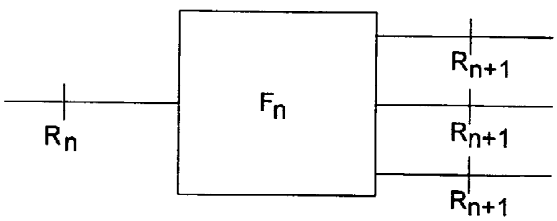

Figure 12. Multiple instances of reference points facing away from the network medium

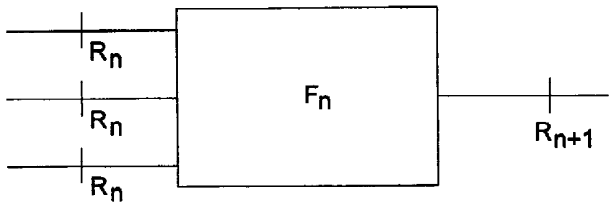

Figure 13. Multiple instances of reference points facing towards the network medium

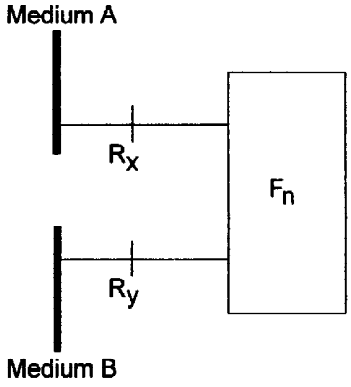

Figure 14. Gateway between different network segments

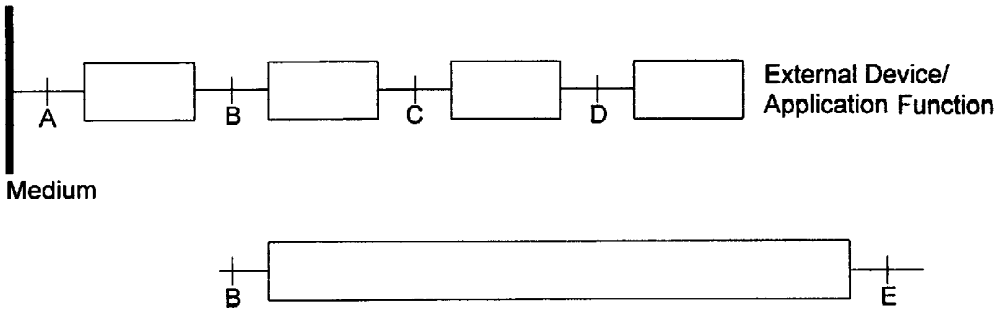

Figure 15. Hierarchy of reference points

Some functional groupings or sets of functional groupings are given names describing their intended use. Whenever according to the rules given below, more than one name is possible to describe a functional grouping, any of the names may be chosen. Normally the name describing the predominant purpose of the functional grouping will be chosen.

Functional groupings which are implemented as a piece of equipment are called units. Units offering direct services to a user of the HBES are called devices.

When a functional grouping implemented as a piece of equipment attaches to reference point A, the medium attachment reference point, it shall be called a network access unit, NAU. Whenever the functionality of a NAU has to be described more precisely, it shall be named, e.g. UI-NAU.

When the primary functional purpose of a functional grouping is neither that of a device nor that of a NAU it shall be called an adaptor or adaptor unit depending on implementation.

Specific functional groupings may have specific names in addition to the generic names given here. One type of adaptor for example, providing for multiple instances of its upper reference point, is also called a multiple device controller.

An adaptor providing for multiple instances of its lower reference point and connecting two or more network segments to build one larger network from these parts shall be called a local network gateway. The term 'of OSI layer n' shall be added when necessary for clarity.

6 Standardization of interfaces at specific reference points

The following interfaces for the Home and Building Electronic System (HBES) will be mapped to the reference points as shown in figure 16.

The standardization of interfaces at reference points allows modular systems which cover the requirements of a broad range of users. In the following sub clauses the location of each of these interfaces in the OSI reference model is described.

6.1 Media interface

Media interfaces (MIs) which are also called media attachment points for each media will be standardized at reference point A. The MI shall be uniquely defined for each combination of media and class. Especially for wired media including plastic optical fibre the definition of the location of the MI is needed. Related to the HBES network the media interface for wired media shall be physically located either as shown in figure 18 or 19. The connection method shown in figure 20 as used in some home control systems shall not be used in HBES because the bus is interrupted when the NAU is disconnected from the bus.

The detailed specifications of media interfaces (MIs) covering for example connectors, input and output impedance, or attenuation will be given in other parts of the HBES standards such as ENV 50090-5-2, ENV 50090-6-3.

6.2 Universal interface

The universal interface (UI) will be standardized at reference point C. The UI is placed at the service boundary of layer 3 (figure 21). Unlike OSI service definitions, the UI is defined not only as a conceptual boundary, but also as a physical interface including mechanical, electrical, functional and procedural specifications, therefore local layers have to be defined for the UI, too.

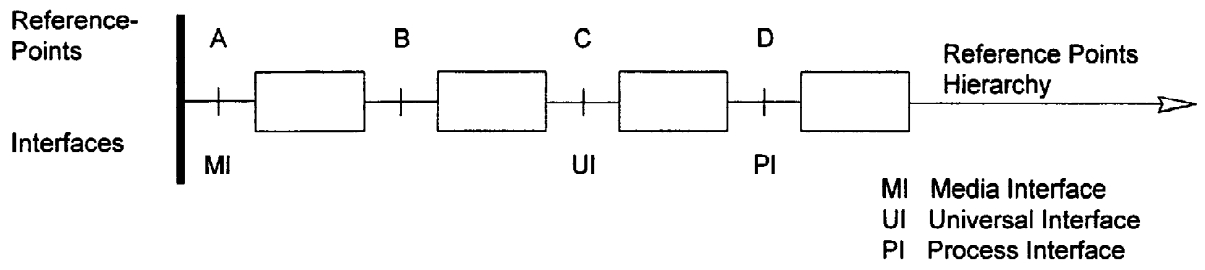

Figure 16. Location of standardized interfaces

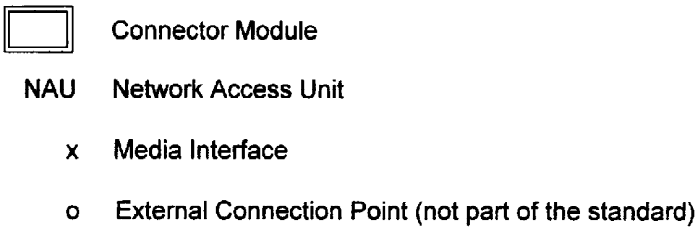

Figure 17. Symbols used in figure 18 to figure 20

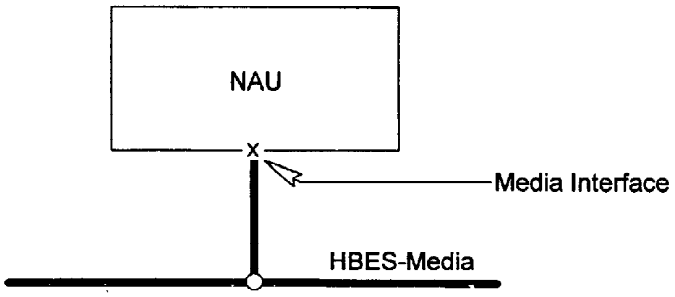

Figure 18. Single-wire connection

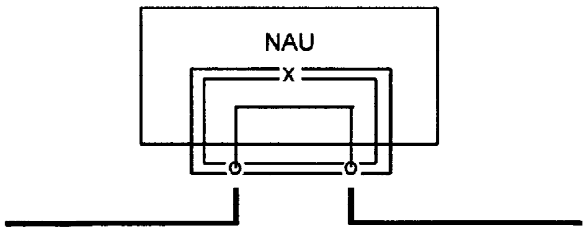

Figure 19. Two-wire connection with no interruption of bus wire when the device is disconnected (recommended solution)

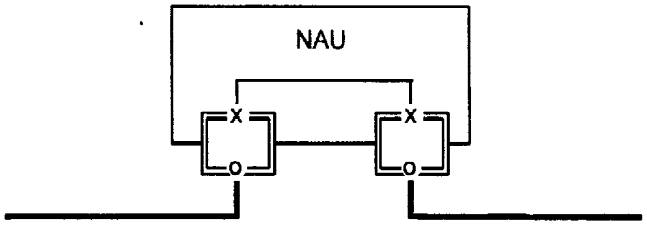

Figure 20. Two-wire connection with interruption of bus wire when the device is disconnected

6.3 Process interface

The process interfaces (PI) will be standardized at reference point D. This is shown in figure 22.

At reference point D a set of different process interfaces will be defined in Part 6 of this standard. Therefore the functionality of the PI-adaptation may be different depending on the type of the PI. For example the PI-adaptation inside the PI-NAU may but need not contain parts of the user process.

6.4 Interfaces at reference point E

Interfaces at reference point E are standardized by other bodies, but the functionalities of the functional groupings E-NAU for selected networks are standardized for HBES.

7 System aspects

Communication takes place between devices, application objects, systems and subsystems. Depending on the views of different kinds of users, installers, planning and maintenance engineers some system aspects are more important than others. The description of those aspects are suitable for clarification of these different views and may be used as references in later parts of the standard. The following aspects are dealt with:

- network topology;
- interapplication;
- grouping;
- system access.

This list may not be complete.

7.1 Network topology

The interoperability between different devices which may be connected to different media is independent of network topology. Physically the different media, subsystems or HBES network segments are connected by gateways. In the case of HBES network segment interconnection the gateway shall include layers 1 to 3. A network segment shall have no special restrictions related to its implemented hierarchical position compared with the other segments. When connecting gateways to external networks it should be taken into account that the position of the connection may have a strong influence on the overall system performance. There may be functional constraints related to individual media characteristics.

At the wiring level, for the basic media, twisted pair and power line, all topologies such as bus, tree, star, loop and any combinations thereof shall be possible. However, other media such as coaxial cables, fibre optic have their own constraints defined in EN 50090-5.

7.2 Interapplication

The HBES is intended to be used for a broad range of applications. Applications can be categorised into application domains. The application domains may be distributed or centralized. This depends on the practical implementations. If devices belong to more than one application domain, additional interapplication support may be needed to coordinate system activities. Therefore the HBES shall allow interapplication coordination. Examples of application domains are given in CENELEC R105-001.

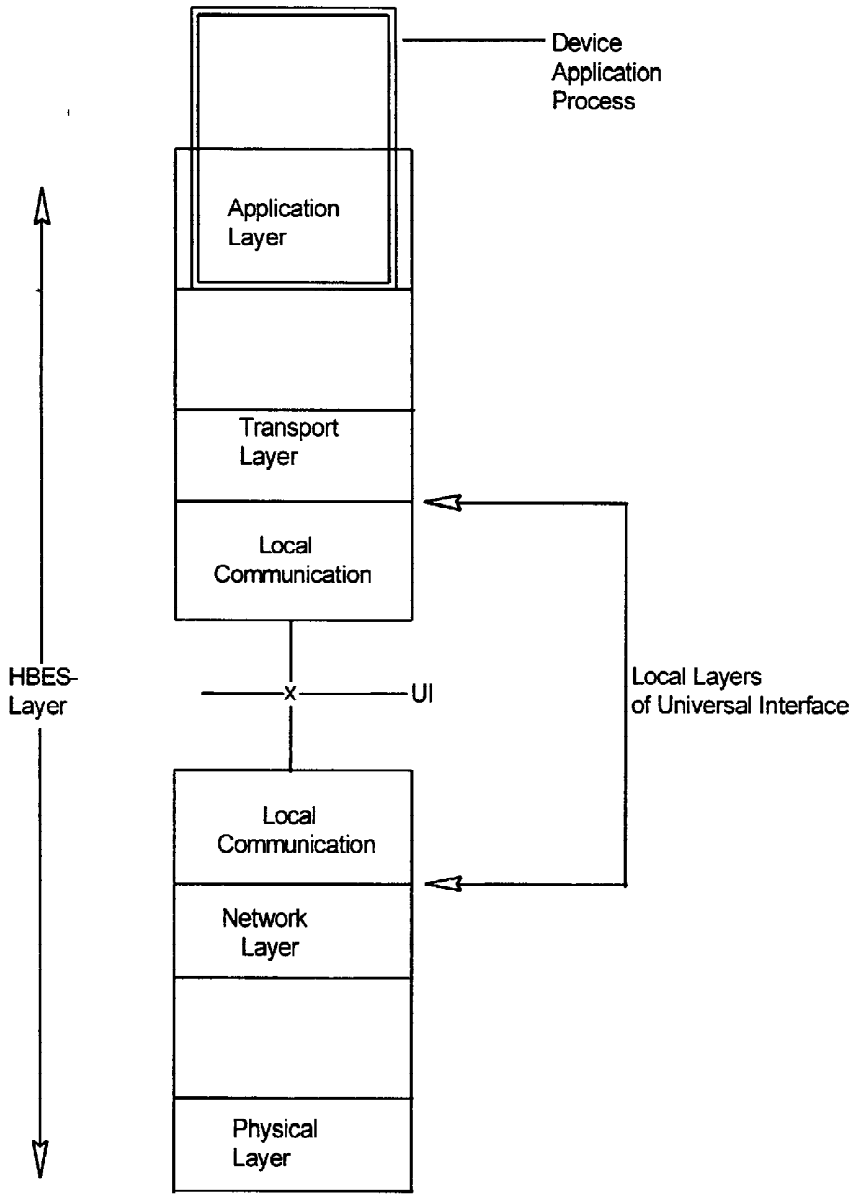

Figure 21. Position of the universal interface

Figure 23 shows the HBES domain as the total home application domain. The HBES allows domain specific functions, such as 'all lights off'.

7.3 Grouping

A group is a collection of units, devices or functions selected according to some criteria. The whole group can then be addressed by one message which may cause all lights to turn off or all volume controls to be set to zero. The HBES shall support this group addressing feature.

Examples of criteria for the creation of groups are:

- applications (e.g. heating, ventilation, audio, security);
- device types (e.g. lights, heating devices, door locks, TVs);
- functions (e.g. volume control, time control);
- geographical zones (see figure 24 for examples).

Grouping can be achieved by use of group addresses or by use of network segments. It shall be possible for units, devices for functions to belong to one or more groups. Groups can be combined (for example 'all lights on the second floor off').

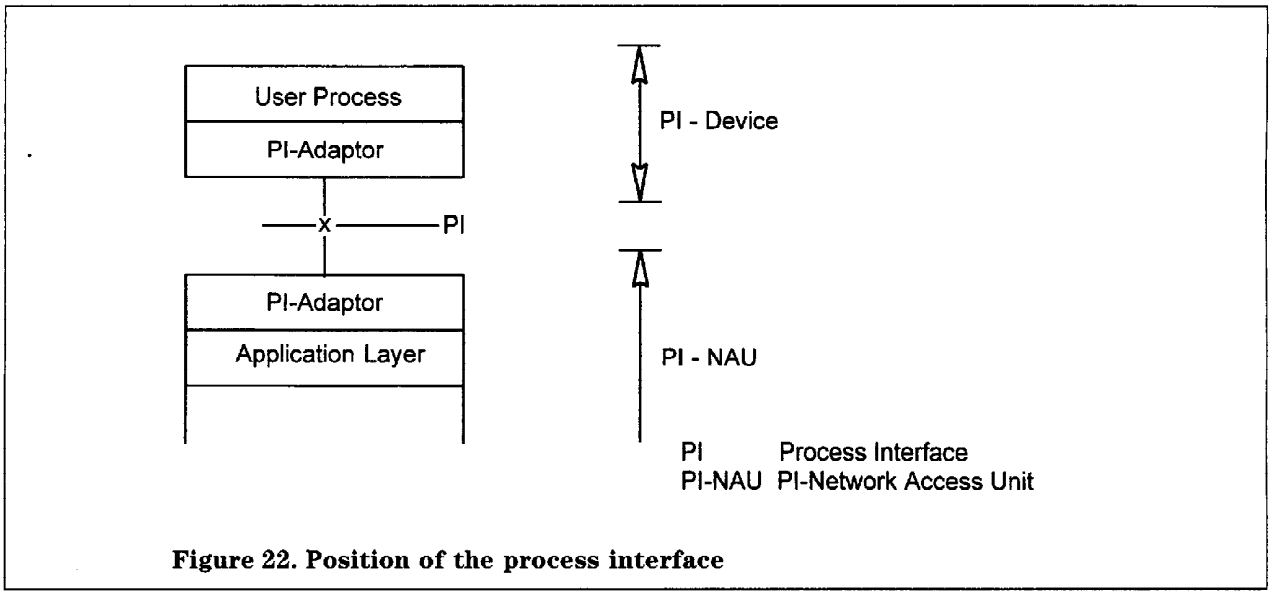

Figure 22. Position of the process interface

7.4 Access

The access aspects of the HBES concern the conflict between security and convenience. This can be explained by two examples:

- to make the HBES reliable and secure, only selected persons may have access to for example vital application parameters;
- the end user shall have an easy-to-use interaction with the HBES.

This requires clearly defined rules for accessing the HBES. The different access conditions, and thereby the required restrictions, are primarily dependent on the type of connection to HBES and on the kind of user.

The type of connection is closely related to a specific method of access.

The types of connections can for example be divided into the categories listed in table 4, each followed by examples of related physical method of access.

Table 4. Connection categories

Connection	Physical method
1) special connection	special tool
2) direct connection	manual activation, wired local activation (e.g. RS-232)
3) wireless remote connection	IR, RF, ...
4) wired remote connection	Public data network with dedicated lines
5) packet switched remote connection	Packet-switching public data network, LAN, WAN
6) public switched remote connection	Public-switched telephone network

As an extension to these categories also the physical location can be a parameter for the access restrictions. An example of such physical location can be 'inside or outside the home or building'.

The kind of user is specified by his requirements and/or experience regarding the interaction with the HBES. Special requirements can be:

- high reliability;
- high flexibility;
- fast response.

Users can be grouped as:

a) skilled persons with program code control experience function: changing instruction code;

b) skilled persons with communication management experience function: changing communication parameters;

c) skilled persons with advanced application management experience function: changing vital application process parameters;

d) special instructed persons with advanced control experience function: changing critical application process (such as security) variables;

e) instructed persons with simple application management experience function: changing non-vital application process parameters;

f) persons with simple control requirements function: changing non-critical application process (such as light) variables;

g) persons with reading requirements function: reading application process variables.

In each group of persons there can exist a hierarchy of authorizations to allow for distribution of the responsibility. As an example of this the following hierarchy can exist in group d):

Scene: An office building with a burglar alarm installed. The alarm is set off by accident by a company employee.

The employee (lowest authorization) is only allowed to stop the alarm bell in his own office. He can then notify the security guard on duty about the cause of the alarm.

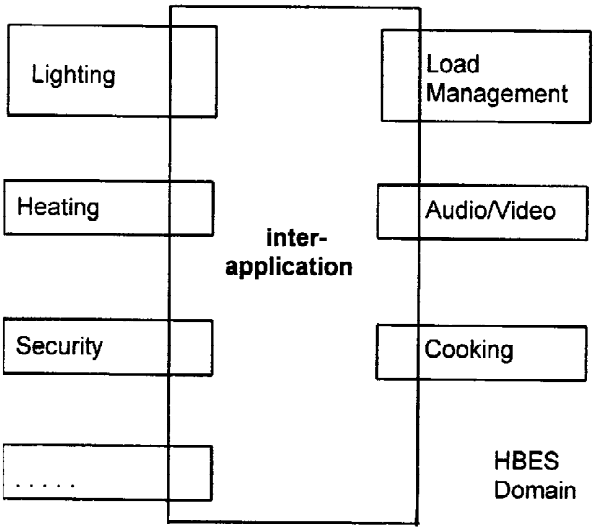

Figure 23. HBES interapplication

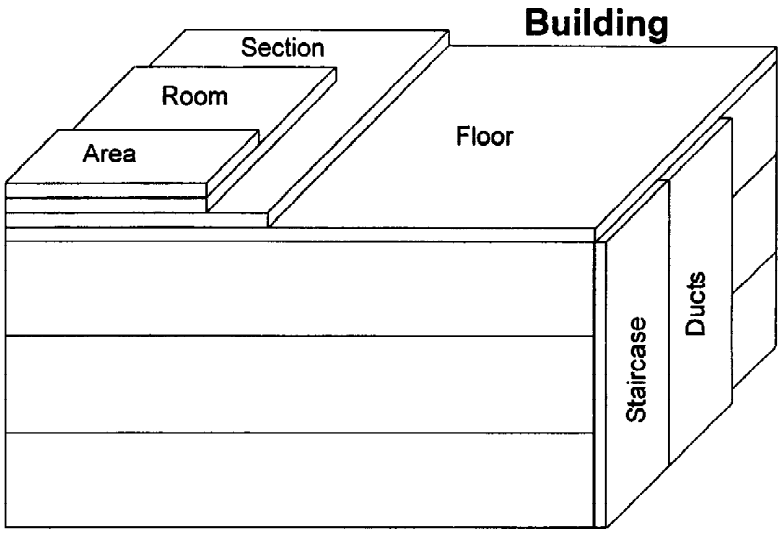

Figure 24. Geographical zones in buildings

The security guard (medium authorization) is allowed to reset the building alarm signal (which is also forwarded to the police).

The security chief (highest authorization) is the only one who can remove this event from the 'highlight alarm log report' (which keeps him up to date with all major events) on the system terminal.

For each group of persons there is an access level to the HBES.

The combination of the 'category of connection' and the 'kind of user' describes examples of all possible types of access levels to the HBES.

Detailed descriptions of the implementation and support of access restrictions are provided in other parts of the standard.

List of references

See national foreword.

BS EN 50090-2-1 : 1996

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