TECHNICAL REPORT

IEC TR 61998

First edition
1999-10

Model and framework for standardization in multimedia equipment and systems

Structure et modèle de normalisation des appareils et systèmes multimédia

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For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary* (IEV).

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

* See web site address on title page.

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CONTENTS

Page

Page

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MODEL AND FRAMEWORK FOR STANDARDIZATION IN MULTIMEDIA EQUIPMENT AND SYSTEMS

FOREWORD

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Technical reports do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful by the maintenance team.

IEC 61998, which is a technical report, has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
100/90/CDV	100/101/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

This document which is purely informative is not to be regarded as an International Standard.

A bilingual version of this technical report may be issued at a later date.

INTRODUCTION

Multimedia technology covers a wide range of technical areas and involves a number of technical elements. Most of the technical elements for multimedia are now being developed and updated. IEC standardization activities on multimedia technology should, therefore, be carried out with enough discussions and clarification on the

- position and relationship of the technology to be standardized among the collection of related technologies,
- scope and framework/guideline of the standardization,
- appropriate standardization organization having the responsibility,
- schedule of the standardization,
- relationship between new work items and the existing standards on multimedia or single-medium technology.

These discussions should be based on appropriate multimedia technology models in order to create a framework for multimedia standardization. This technical report is a reflection of those discussions in IEC/TC100 and is expected to contribute as a guideline for IEC standardization experts and National Committees interested in multimedia equipment and systems, and is also expected to contribute to strategic discussions in IEC/TC100 Advisory Group on Strategy.

MODEL AND FRAMEWORK FOR STANDARDIZATION IN MULTIMEDIA EQUIPMENT AND SYSTEMS

1 Scope

This technical report provides models and frameworks for the standardization of multimedia technology, being undertaken or to be undertaken by the IEC.

In general, multimedia technology covers

a) system interface:
- inter-system connection
- intra-system connection
- homebus interface
- LAN interface
- etc.

b) user interface:
- pictogram
- gesture
- etc.

c) interchange and distribution:
- interchange format
- protocol
- abstract service
- etc.

d) measurements and management:
- colour management
- data distribution management
- security
- etc.

e) multimedia data and contents:
- authoring
- manipulation
- etc.

This technical report focuses on the areas of IEC responsibility and items based on general discussions of modelling for multimedia equipment and systems.

2 Reference documents

ISO/IEC 7498-1, *Information technology – Open Systems Interconnection – Basic Reference Model – Part 1: The Basic Model*

ISO/IEC 9316-2, *Information technology – Small Computer System Interface – 2(SCSI2) – Part 2: Common Access Method (CAM) – Transport and SCSI interface module*[1)]

ISO/IEC 11585, *Operational model for document description and processing languages*

ISO/IEC 14542, *Information technology – Multimedia and hypermedia: Model and framework*

IEEE 1394:1995, *IEEE standard for a high-performance serial bus* (description)

DAVIC 1.0 specification, *Part 2: System reference models and scenarios*

3 Definitions

For the purpose of this technical report, the following definitions apply.

3.1
originator
entity, system or device that provides information or service, or container which includes information or service

3.2
recipient
entity, system, operator or device that receives information or service, or container which includes information or service

3.3
multimedia technology
a systematic coordination of different single-medium technologies

NOTE Multimedia indicates an integration of any information that can be represented, stored, transmitted and processed digitally, including text, graphics, still and moving images, audio, video, animation data and sound.

Abbreviations of multimedia technology are explained in annex J.

4 Generic model

The generic model clarifies multimedia technology and its boundaries.

Standardization is, in general, required to obtain the following:

- physical and logical connectivity,
- easy operation,
- safety and security,
- easy implementation, and
- environmental safeguards.

1) To be published.

The major purposes of multimedia standardization are:

- physical and logical connectivity

  Multimedia data interchange and distribution are based on reliable and wide-band communication media such as ISDN and interchangeable storage media such as CD-ROM. Protocols, formats, interfaces, and other data structures of the media are required to be standardized. The features of multimedia data, in particular, make those standards more complicated than in the case of a single medium.

- easy operation

  Multimedia systems contain a number of basic single-medium parts, each of which requires appropriate interaction with users or other systems. In order to realise feasible and human-recognizable operation for the multimedia systems, simplified and standardized user-system interfaces are essential.

- safety and security

  Multimedia equipment and systems form or will form a basic and important infrastructure of national and international activity. Some multimedia data are required to be highly secured. Some systems are required to be strongly protected and besides their operation should be comfortable and safe for operators whose sense organs need to access concurrently to their corresponding media; visible, audible, and other sensible media. Safe and secured environments should be implemented by being based on some guideline and standards.

All the subjects to be standardized for the purpose can be modelled by the relationship between an originator and a recipient.

Figure 1 – Generic model

Each multimedia technology for the relationship should be discussed along with appropriate axes defined to describe corresponding features of the relationship.

4.1 Physical and logical connectivity

When considering physical and logical connectivity, an originator is positioned to be an entity, system or device which provides information, and a recipient is positioned to be an entity, system or device which receives the information. They are reconnected with each other by a relationship: information transfer. The information transfer can be carried out by different types of information transfer media. Another aspect of the information transfer is a structure of data to be transferred by the medium.

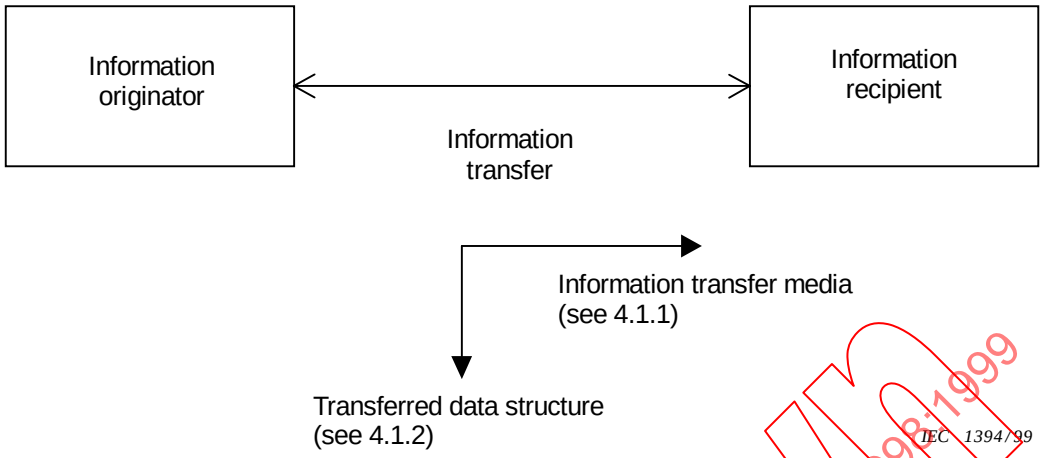

Figure 2 – Model of physical and logical connectivity

4.1.1 Information transfer media

4.1.1.1 Inter-system model

The physical media for information transfer between systems are classified into

- Broadcasting media

  Broadcasting media support simultaneous information transfer to a number of recipients. Existing commercial examples of the wireless broadcasting media are BS, CS and terrestrial. As far as low-level protocols are concerned, CSMA (carrier sense multiple access) media like Ethernet are broadcasting media.

- Intercommunication media

  Telecommunication media support information transfer between two or more systems at a time. Existing commercial examples of telecommunication media are PSTN (public switched telephone network), CSDN (circuit switched data network) and PSDN (packet switched data network). Their areas of information transfer differentiates the media, for example, between

  - local area network,
  - metropolitan area network, and
  - wide area network.

- Interchangeable storage media

  Interchangeable storage media (ISM), for example optical disks or magnetic tapes, facilitate data transfer by allowing the physical movement of the ISM from system to system. Large amounts of data transfer can inexpensively and quickly be realized by using interchangeable storage media.

  IC card, SmartMedia, Flash memory card and some PC cards are classified as ISM.

They associate open systems as described in figure 3.

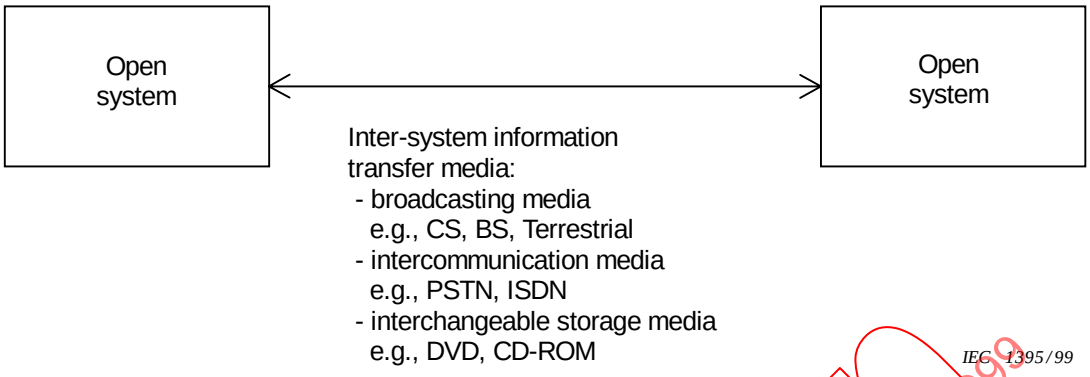

Figure 3 – Inter-system model

4.1.1.2 Inter-device (intra-system) model

Mechanisms for information interchange between devices or subsystems within a larger system are referred to as interfaces. Examples of the interfaces are:

- computer interface such as SCSI (small computer small interface, ISO/IEC 9316-2) and IEEE 1394 (high-speed serial interface),
- display unit interface,
- keyboard interface, and
- consumer equipment interface employed, for instance, between a television receiver and its remote control unit.

Devices or subsystems interact as shown in figure 4.

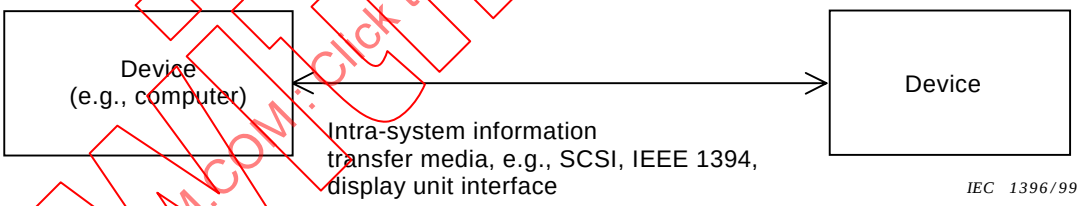

Figure 4 – Inter-device (intra-system) model

4.1.1.3 Boundary model

Some information transfer media can be used both between systems and between devices/subsystems. Examples are:

- fibre channel,
- infra-red communication, and
- IEEE 1394.

4.1.2 Transferred data structure

4.1.2.1 Data structure in inter-system/intercommunication media

Transferred data structures employed in inter-system/intercommunication environments may be represented by the OSI layered model which was standardized by ISO/IEC JTC 1/SC 21. The data structure consists of seven layered protocols, each of which is treated as corresponding peer-to-peer entities within communicating open systems.

The top layer entities for application protocols provide services to their application itself within an open system. Application data which are outside the scope of the OSI model can be considered from the following points of view.

- Contents

  A major feature of multimedia systems is that multiple types of content data are supported by the systems.

- Structure

  Multiple types of content data are integrated into a structure which is appropriate for the application. An instance of multimedia data structure modelling is shown in 5.1.

- Creation

  The structured application data are sometimes created step by step. The data from each step can be transferred between corresponding applications. Instances of modelling of multimedia data creation are shown in 5.2.

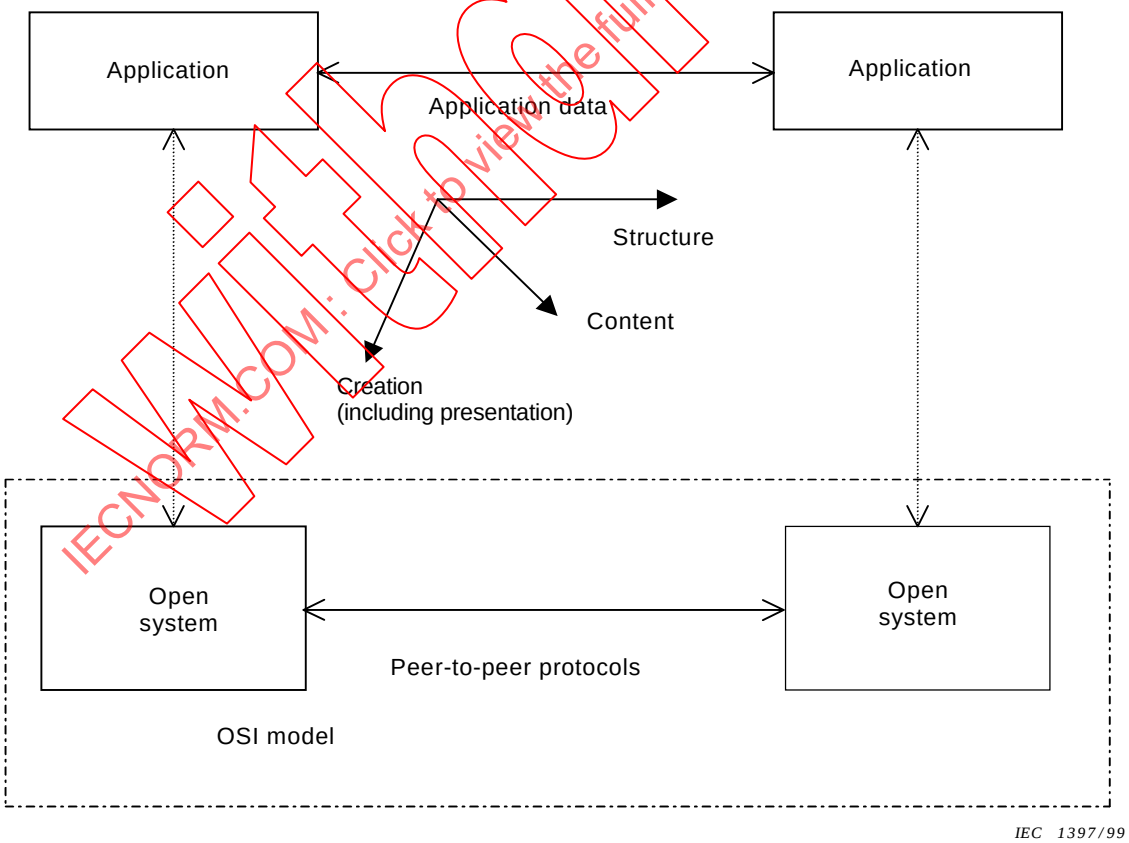

Figure 5 – Data structure in inter-system/intercommunication media including OSI data structure and application data

4.1.2.2 Data structure in inter-system/interchangeable storage media

Transferred data structure employed in an inter-system/interchangeable storage media (ISM) environment can be represented similarly to the data in inter-system/telecommunication. ISM are physically moved between systems to transfer the data on the storage media. To allow open data transfer, the data formats on the media should be standardized as relationships between systems. Logical structures such as volume and file are defined on physical structures such as track and sector to configure a layered structure.

Application data on file structure should be treated in the same manner as those on inter-system/telecommunication media.

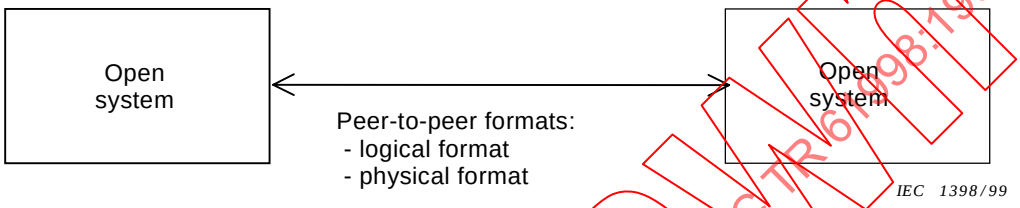

Figure 6 – Data structure in inter-system/interchangeable storage media

Some detailed discussions of data structure modelling for open system interconnection via ISM are shown in 5.6.

4.1.2.3 Data structure in an inter-device model

Data structure in an inter-device model is also modelled in a layered manner. As far as a display unit interface is concerned, for example, the type and dimensions of the connector and cable should be considered in its physical layer. Interface signals should be classified into the following levels:

- composite/component,
- colour model,
- frame/field, and
- pixel structure.

4.2 Easy operation

Multimedia user-system interfaces are described as a relationship between a multimedia system and an operator. Under this relationship, a system can provide information and services to an operator and vice versa.

The relationship can be implemented with several information types corresponding to sensing organs, such as

- visual,
- auditory,
- tactile,
- olfactory, and
- acceleration-sensing.

The information and services between system and operator can be classified into several layers:

- semantics,
- state/learning,
- primitive action.

Considering those aspects of multimedia user-system interfaces, they can be described by the generic model in figure 7.

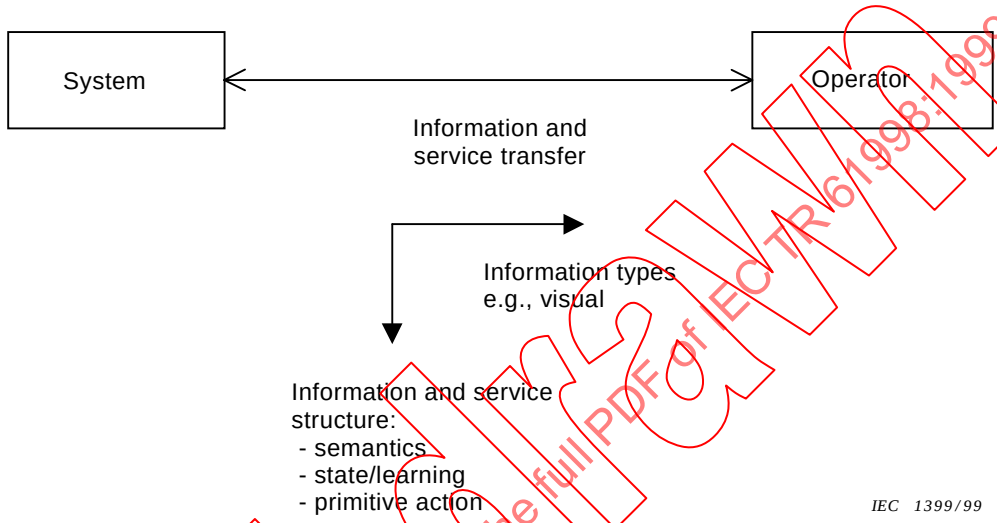

Figure 7 – Generic model for user-system interfaces

4.3 Security

All aspects of security can be treated as protection against some interrupts intervening between originator and recipient in the generic model. Due to the protection,

- confidentiality,
- integrity, and
- availability

are satisfied in the information transfer between them.

Security mechanisms, for example encryption, authentication, access control, should be considered from the point of view of both the media and data structure for the information transfer.

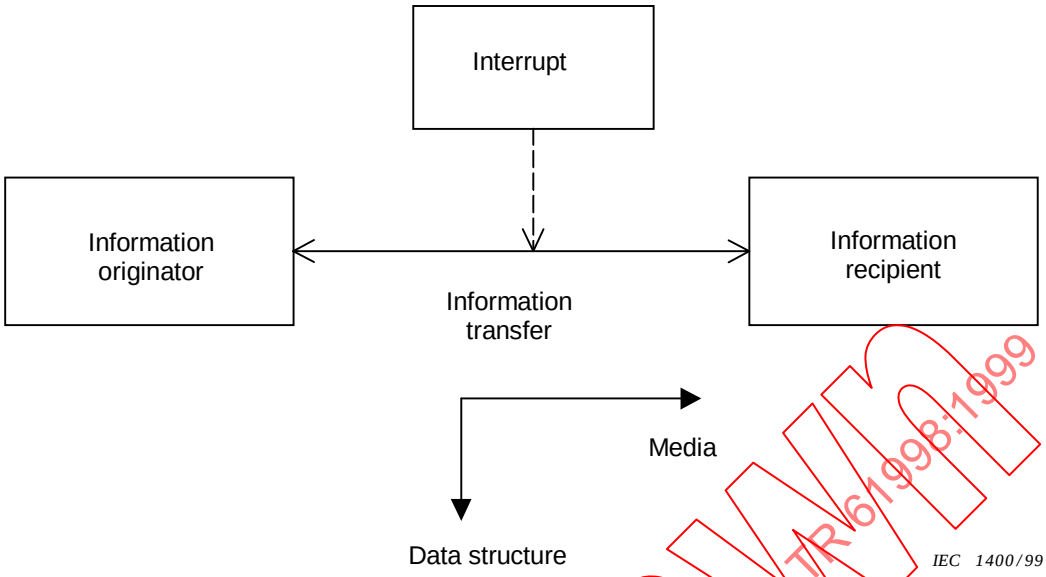

Figure 8 – Generic model for security

5 Specific models

Parts of the generic model discussed in clause 4 can be described from different points of view to configure different specific models. In this clause, typical specific models are shown to clarify the technology to be standardized, in particular, by IEC/TC 100.

5.1 Multimedia data structure

Modelling of the application data structure described in 4.1.2.1 and 4.1.2.2 is discussed in detail in this subclause.

Multimedia information consists of a number of information containers which include several types of contents. In addition, multimedia information sometimes includes hyper-links for flexible access to specified objects. These structures are described by structure models.

An example of a structure model is the Dexter model, which consists of three layers:

- run-time layer,
- storage layer, and
- within-component layer.

The storage layer specifies a structure of components associated with each other. A component means an abstraction of an entity, which is called a node in some hypertext networks. The component is treated as a generic container of contents. Some content types could be character stream, geometric graphics, raster graphics, animation, etc.

Figure 9 shows some functionality of typical existing multimedia/hypermedia standards classified by the Dexter model.

Dexter model	HyTime	MHET	HTML
1. Run-time layer	Object modifier, and event projector	MHEG run-time object	None
2. Presentation specification	Modifier scope, projector scope and linkterm	Channel rendering elementary action	None
3. Storage layer			
3.1 Atomic element	Event	MHEG composite object	HTML document
3.2 Link	Link and clink	MHEG link/action object	Anchor
4. Anchoring	Addressing and query	Position spec. timestone, etc.	URL/index
5. Within-component layer	Object	Component object	Text, graphics, etc.

IEC 1401/99

Figure 9 – Listing of functionalities of existing multimedia/hypermedia standards compared with the Dexter model

Some objects of IEC applications classified in run-time layer and within-component layer could be subjects for standardization by IEC/TC 100.

5.2 Data creation

A modelling of application data creation in 4.1.2.1 and 4.1.2.2 is discussed in detail in this subclause.

A data creation model describes the creation processes of multimedia/hypermedia data. A data interchange of each processing step is required and therefore standardization has to be performed for the data structure and format employed in each step.

ISO/IEC JTC 1/SC 18 has developed an operational model for electronic document creation, which is illustrated in figure 10a. It could be applied to the creation of other multimedia title data as shown in figure 10b.

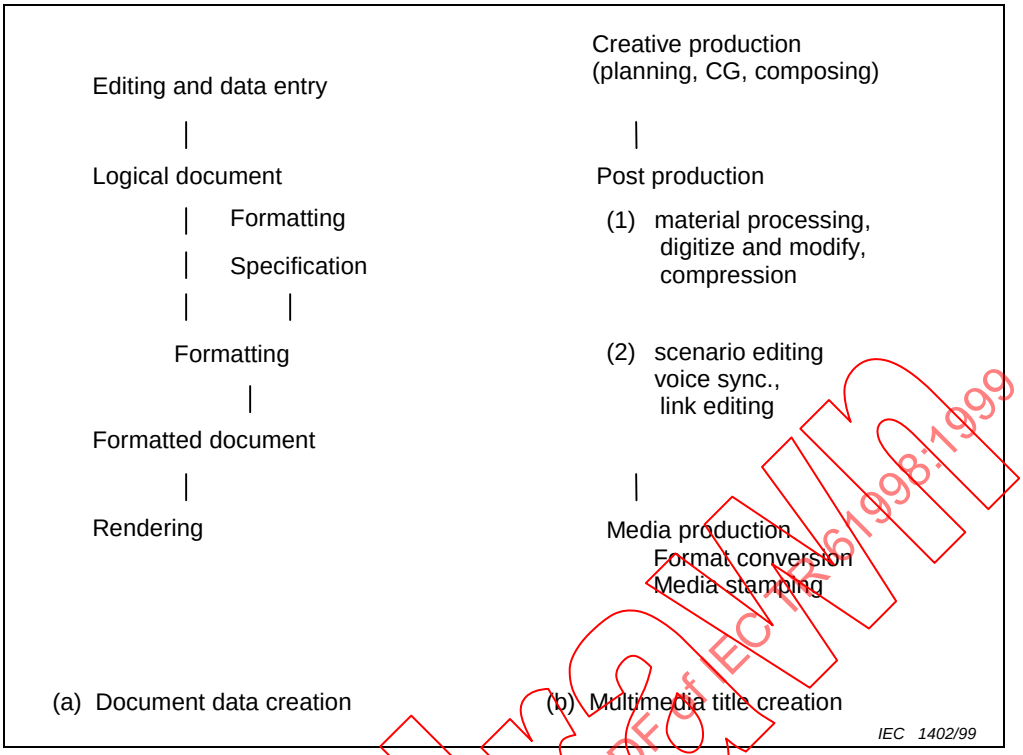

Figure 10 – Models of data creation

The rendering of documents and all the technology of multimedia title creation could be within the scope of IEC/TC 100.

Focusing upon font data creation in a multimedia environment leads to a model of font and multimedia document creation shown in figure 11. The properties without an asterisk in the figure may be required for standardization in the near future.

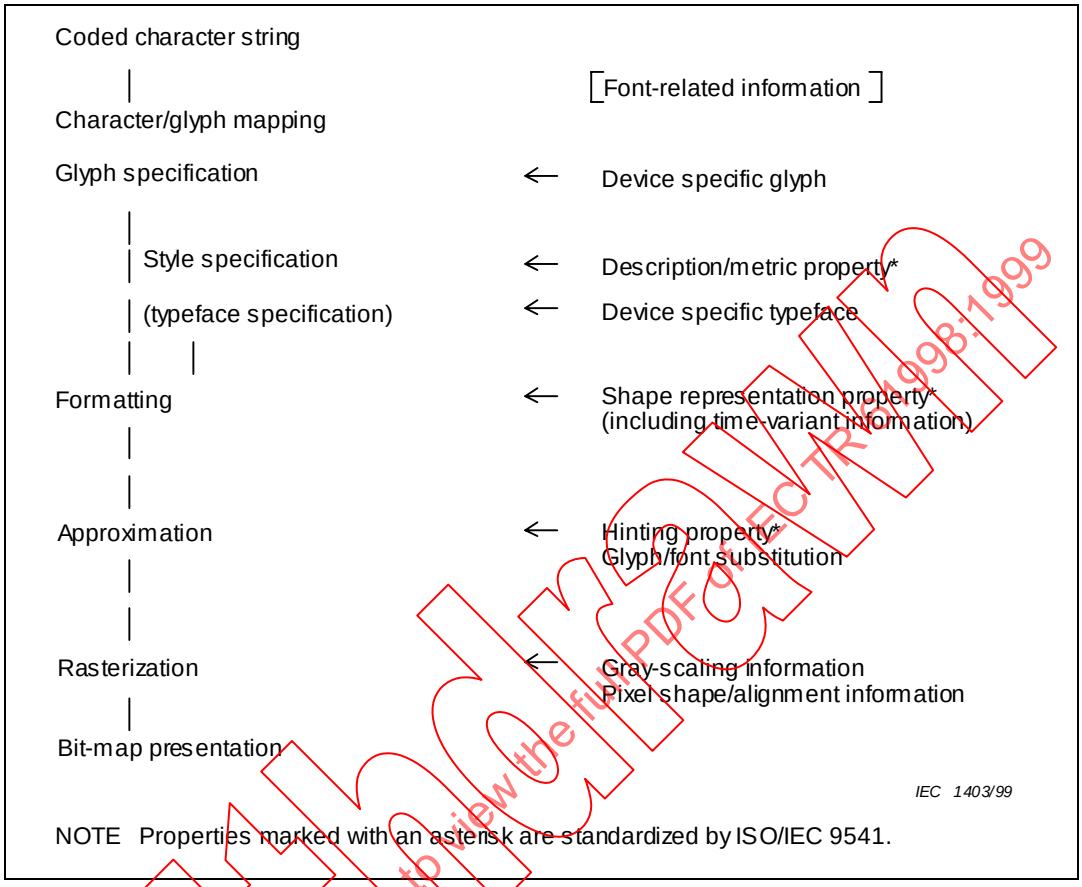

Figure 11 – Model of font and multimedia document creation

The gray-scale information and pixel shape/alignment information for multimedia system should be reviewed within IEC/TC 100.

5.3 Equipment structure

The logical and physical structures of multimedia/hypermedia systems or equipment are described using system models.

Multimedia systems and equipment contain functional blocks and interchange multimedia data through a communication system or an ISM (interchangeable storage medium) distribution system as shown in figure 12. They have interfaces which may be subjects for future standardization.

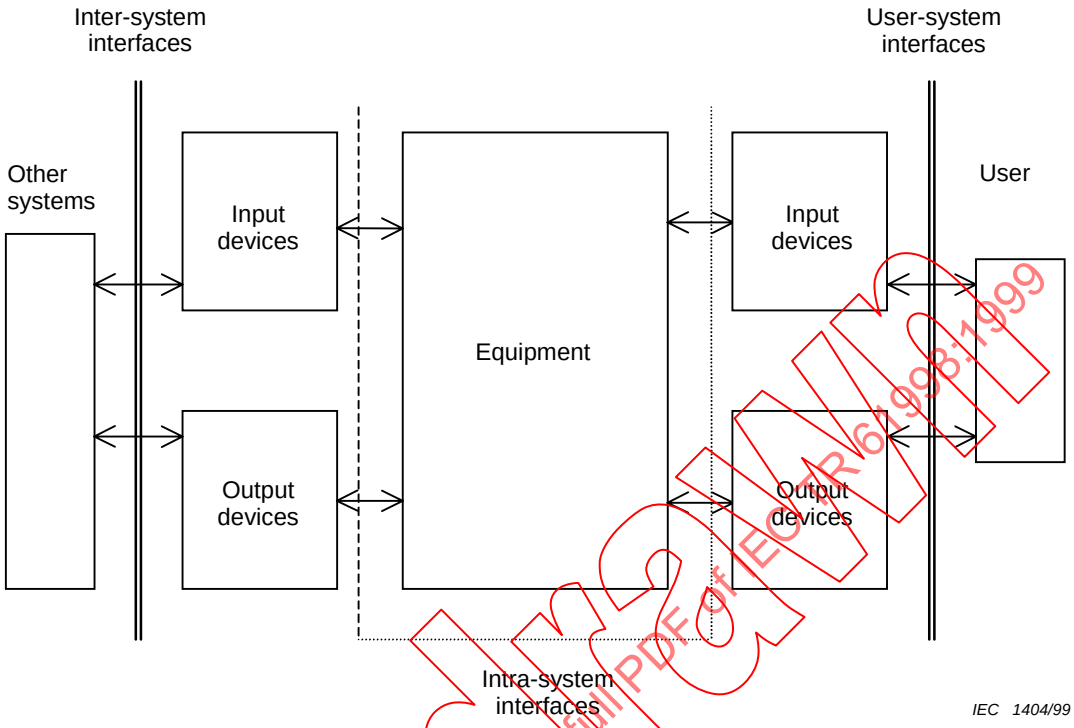

Figure 12 – An example of system model

IEC has been standardizing the key technology of equipment and devices. IEC/TC 100 is responsible for standardizing the aspects of the physical issues of inter-system and intra-system interfaces and some user-system interfaces.

5.4 User-system interface

Multimedia systems can provide us with complicated information in easily perceptible forms for our sensing/recognition capabilities and can possibly be treated with desirable operability. Users of multimedia systems, therefore, expect sophisticated user-system interfaces to be easy to use.

User-system interfaces should be modelled by hierarchical subsystems which include a physical sensing layer up to a logical semantic recognition layer.

Each subsystem for an IEC specific application should be the subject of IEC/TC 100 standardization.

5.5 Distribution and management

A multimedia digitized environment has emphazised requirements for appropriate management of data distribution, since the technology makes it possible to

a) duplicate the data without distortion,

b) modify the data to create alternatives, and

c) account for actual use of proprietary data.

The data distribution model should clarify that

- multimedia/hypermedia data in every step of data creation can be interchanged,
- the data or portion of the data should be uniquely identified, and
- interchanged data should be an object for appropriate charging.

Those requirements should be supported by cryptographic technology which consists of

- privacy,
- authentication,
- digital signatures, and
- non-repudiation.

An example of the distribution and management model is shown in figure 13.

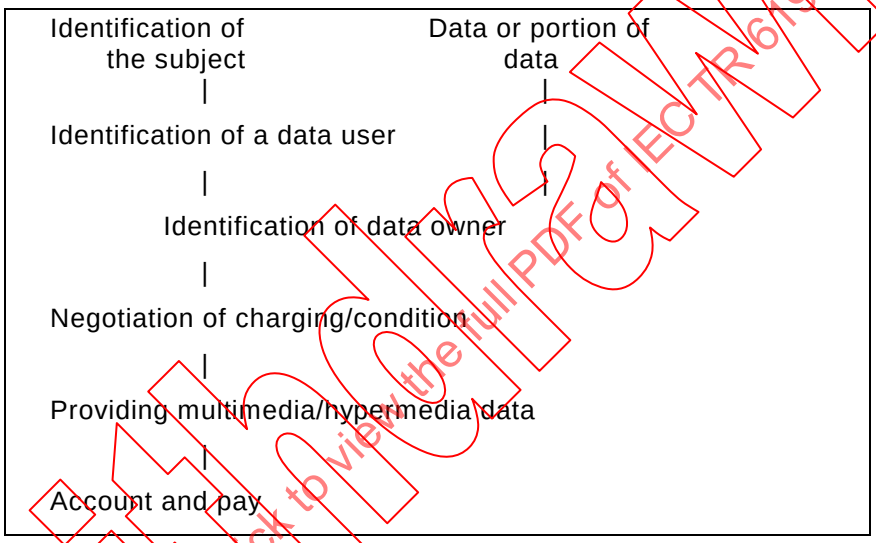

Figure 13 – Distribution and management model

Cryptographic technology for IEC/TC 100 specific applications should be standardized by IEC/TC 100 in close collaboration with related standardization organizations such as JTC 1/SC 27 (see 5.7).

5.6 Open-system interconnection via ISM

5.6.1 Specific layers

The general structure of the layered architecture of open system interconnection via ISM provides architectural concepts, from which the model for information interchange by ISM has been derived, making specific choices for the layers and their contents.

The model contains seven layers:

a) the application layer (layer 7);
b) the presentation layer (layer 6);
c) the file layer (layer 5);

d) the volume layer (layer 4);

e) the logical storage layer (layer 3);

f) the physical storage layer (layer 2); and

g) the physical layer (layer 1).

These layers are illustrated in figure 14.

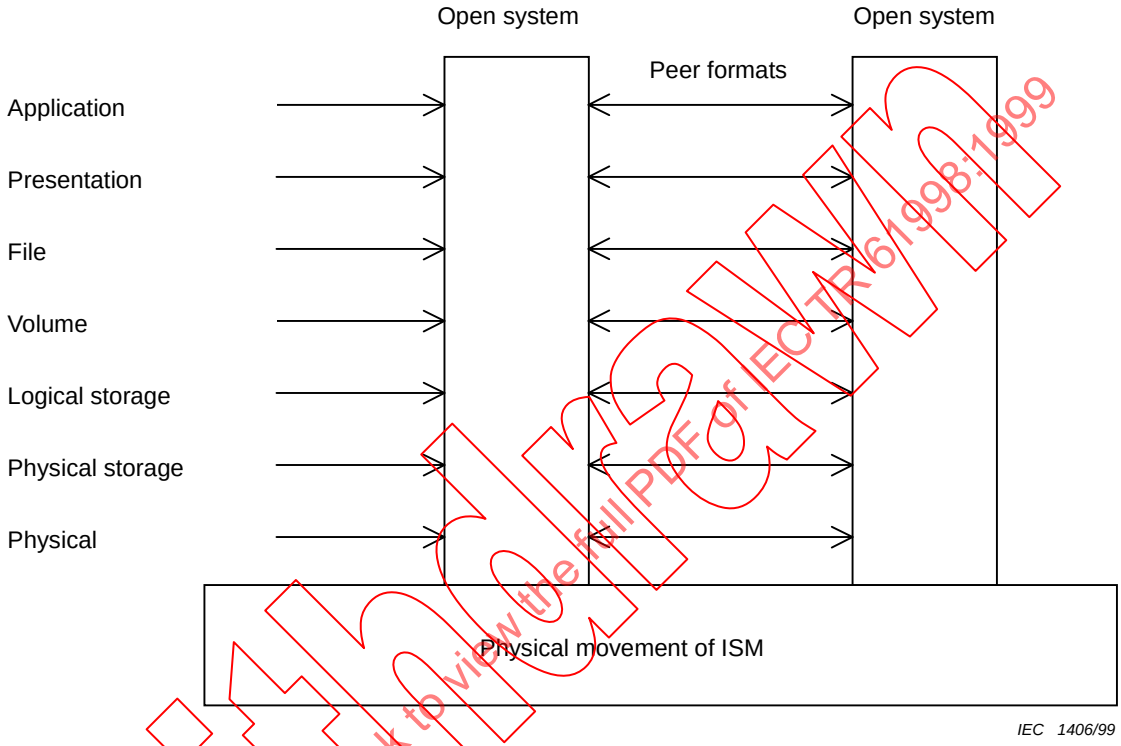

Figure 14 – Seven-layer reference model and peer formats

The highest is the application layer, and it consists of the application-entities that cooperate in the information interchange between open systems. The lower layers provide the services through which the application-entities cooperate.

Layers 1 to 6, together with the physical media (ISM), provide a step-by-step enhancement of information interchange services. The boundary between two layers identifies a stage in this enhancement of services at which a service standard is defined, while the functioning of the layers is governed by format standards.

NOTE In most of the existing standards for information interchange by ISM, services have been specified as requirements for systems.

Not all open systems provide the initial source or final destination of information. When a certain type of ISM is not distributed among all open systems directly, some open systems act only as open systems for medium conversion, passing upper-layer data to other open systems. The functions and formats which support the forwarding of data are then provided in the lower layers. This is illustrated in figure 15.

As for the ISM whose major applications are consumer electronics, all the layers should be standardized by the IEC, in particular, IEC/TC 100.

Technical issues for each layer are shown in 5.6.2 to 5.6.8.

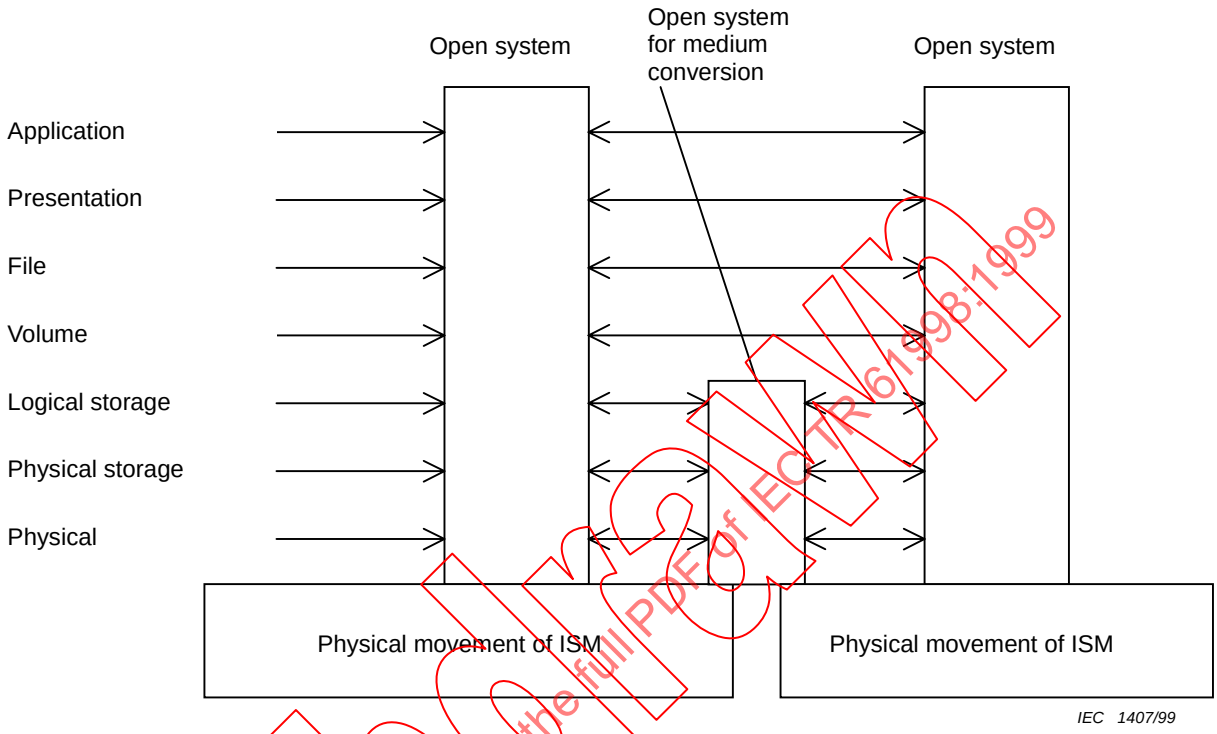

Figure 15 – Information interchange involving open systems for medium conversion

5.6.2 Application layer

The application layer contains all functions which imply information interchange between open systems and which are not already performed by the lower layers. These include functions performed by programmes as well as functions performed by human beings.

In particular, application-entities maintain, as part of the pre-knowledge necessary for information interchange (or have access to, via use of a directory facility), information on the use of activity by the peer entities with which they may need to cooperate.

An application-entity can be structured internally into application-layer objects representing groups of functions. Use of one grouping of functions may depend on the use of some other functions, and the active functions may vary during the lifetime of the application-association.

5.6.3 Presentation layer

The presentation layer performs the following functions to help accomplish the presentation services:

a) representation of the abstract syntax chosen by the application-entities in the transfer syntax including format and special purpose transformations (e.g. data compression);

b) restoration of previous syntaxes on the occurrence of certain events;

c) use of file services.

Application-entities agree on the abstract syntaxes to be used for their information interchange. It is necessary that these abstract syntaxes are represented in appropriate transfer syntaxes for communication to take place.

NOTE Within a real open system, data defined in terms of an abstract syntax is represented within the local system environment by a local concrete syntax. A transformation may be necessary between the local concrete syntax and the transfer syntax. Thus, in information interchange between real open systems, there are three concrete syntax versions of the data: the concrete syntax used by the originating application-entity, the concrete syntax used by the receiving application-entity, and the concrete syntax used between the presentation-entities (the transfer syntax). It is clearly possible that any or all these syntaxes are identical. The local concrete syntaxes are not visible within the open system environment.

The fact that there is or is no actual transformation of concrete syntax has no impact on the presentation-format. There is not one single predetermined transfer syntax.

5.6.4 File layer

The file layer has the following functions.

a) Area management in the logical volume space

The file entity manages the unallocated area in the logical volume space provided by volume services.

b) Read and write of records in a file

The file entity reads/writes records in a file. It controls user data by the information of RCW (record control word).

c) Processing for initialization

The file entity requests the volume layer to provide the logical volume space, where files are configured.

5.6.5 Volume layer

The volume layer has the following functions.

a) Management of the volume spaces provided by the logical storage services

The volume entity manages the volume spaces provided by the logical storage services, particularly the partitions and the spaces which are not contained in the partitions.

b) Identification of the volume spaces provided by the logical storage services

By using a volume identifier, the volume entity uniquely identifies the volume space provided by the logical storage services.

c) Management of multiple volume space

The volume entity provides file entities with a logical volume space, which is a set of the partitions in the volume spaces provided by the logical storage services.

d) Boot

The volume entity has the functionality to boot a system. This function cannot be provided to upper layers.

5.6.6 Logical storage layer

The logical storage layer has the following functions.

a) Logical to physical sector mapping

This function maps the logical sector number to the physical sector location where the data contents are actually to be recorded. Contiguous logical sector numbers do not necessarily mean contiguous physical location, they may be mapped to separated physical sectors because of sparing of a defective physical sector.

b) Physical sector identification/addressing

This function identifies the physical sector by its sector ID which is provided by the physical storage layer.

c) Defect management/sector sparing

These functions enable the write/read data integrity services of this layer.

d) Certification of the sectors

This function is utilized when the logical storage layer provides certified sectors to the volume layer in the initial preparation.

5.6.7 Physical storage layer

The physical storage layer has the following functions.

a) Data encoding/decoding for recording/reading

This function encodes the user data to the modulated bits appropriate for each ISM when recording, and decodes it back to the user data when reading. Physical recording/reading is the function of the physical service data unit of the physical layer.

b) Data synchronization

This function adds the data synchronization marks to the user data when writing and utilizes it for data synchronization when reading.

5.6.8 Physical layer

The physical layer has the following functions.

a) Mechanical identification of a volume

The physical dimensions and the shape of the storage medium cartridge of a volume are identified by this function.

b) Recording method identification of a medium

This function identifies the recording method for the medium, such as

- mechanical (punched hole),
- magnetic,
- optical (reflectivity change),
- magneto-optical, and
- phase change (amorphous/crystal).

c) Recording/reading of physical service data unit

The physical service data units are recorded on or read from the medium according to the identified medium type and recording method.

d) Write/read circuit management

This function deals with the electrical signal of the storage head circuit for recording and reading.

e) Write/read head positioning control

This function deals with the storage head seeking the specified physical location of the medium.

5.7 Security

The specific model of security for multimedia information interchange is described as shown in figure 16. Security measures for the intentional threats

- wiretapping and alternation;
- illegal use and operation (intentional or accidental);
- illegal access

are

- encryption and message authentication;
- authentication and signature monitoring;
- access control

respectively.

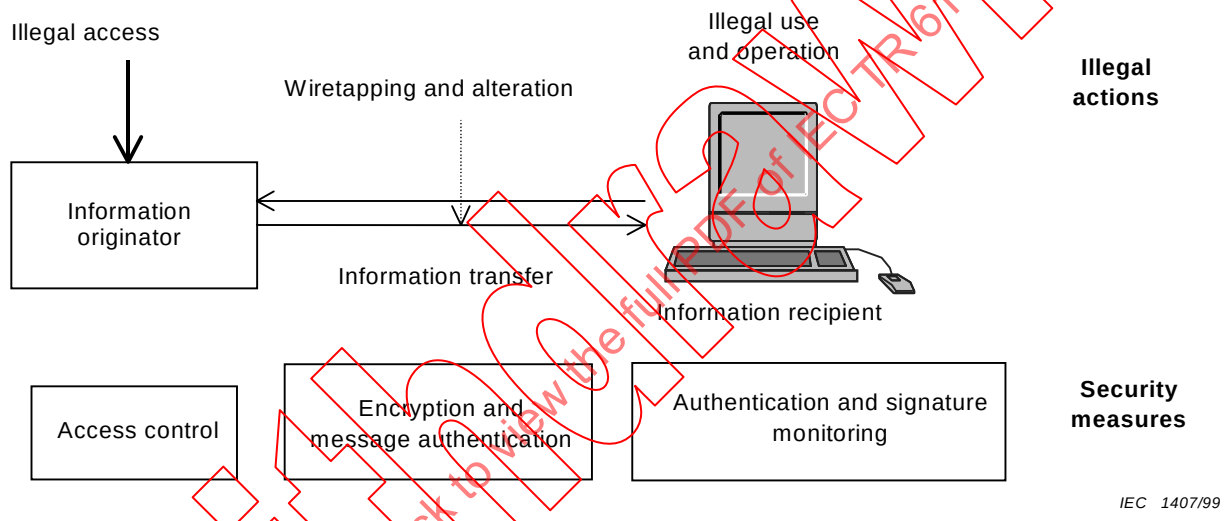

Figure 16 – Illegal actions and security measures

To protect clucking from outside networks, access control, encryption and message authentication should be implemented on the basis of public standardization.

5.8 Information appliance

An information appliance is one of the major issues for IEC/TC 100. In particular, it is requested that the interfaces between devices which compose home electric appliances be standardized for customer applications in the home and mobile environments. They are illustrated in figure 17, which consists of

a) transmission interface device (modem, portable telephone, digital satellite tuner, etc.) which exchanges data with another system;

b) information management device (PC, set-top-box, home electric appliances, etc.) which controls information and equipment;

c) storage device (PC server, video server, etc.) which stores digital video, voice, music and text information;

d) presentation device (television set, printer, projector, etc.) which represents visible and audible information to users;

e) input device (mouse, remote commander, etc.) which inputs operation and information from users.

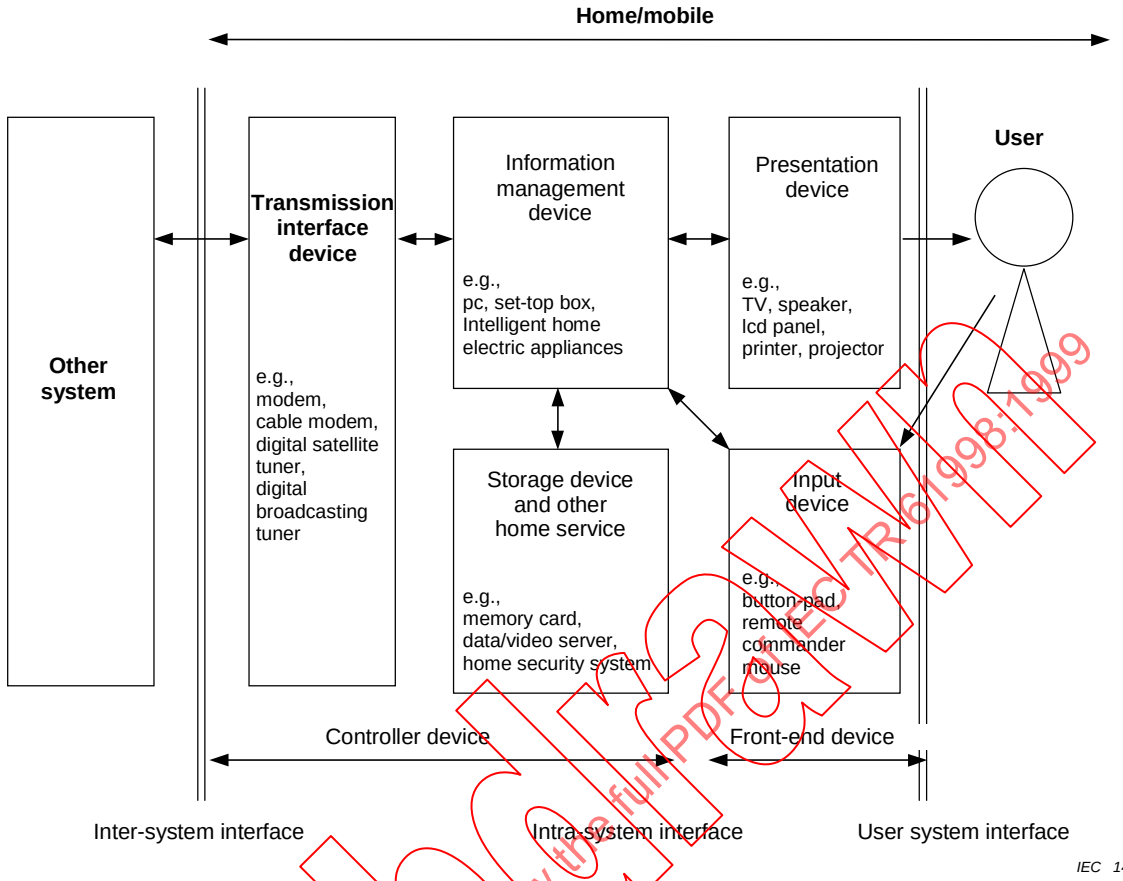

Figure 17 – Information appliance model

5.9 Application specific modelling

More detailed position and classification of multimedia technology should be considered by using the corresponding application specific modelling.

Actual topics and technical issues to be standardized are discussed in annex A to annex G.

6 Frameworks

6.1 TC 100 frameworks

The modelling discussion should result in recommended TC 100 frameworks for multimedia standardization to be taken by IEC/TC 100. For the discussion, it is important to consider the overview of existing standardization activities for multimedia technology which is summarized in annex H.

Some frameworks are shown in clause 6 by enclosed texts such as this paragraph.

6.2 Examples of new work items

The frameworks will derive suggestions of actual work items to be carried out by IEC/TC 100.

Some proposed work items, for example, are shown for their scope and user requirements.

a) Digital interface for display unit

The digital interface specifications which apply to the connection between a digital display unit, for example a liquid crystal display (LCD) unit, and a computer are standardized. The use of an existing analogue interface requires additional D/A and A/D conversions, which makes the implementation complicated and can introduce data errors or analogue noise. Standardized digital interfaces can contribute to the simplification of the implementation.

b) Interchange format of games software

A system-independent interchange format for describing games software is specified, to make it possible to distribute games software packages which can be applied to conforming games machines and played on them. All the games software should be played, at least with minimum performance, on different games machines. Open on-line distribution of games software is also required.

c) Power distribution for information networks

Power distribution for information networks improves energy-saving and safety by offering a standard distribution scheme with the functionality required for multimedia equipment. Its standardization for multimedia equipment can achieve a similar energy-saving to that of a personal computer.

A synchronization of "sleep-mode" instigation and duration between energy-saving display control and equipment could be a key issue, thus making it feasible for a minimum system structure to operate appropriately even for more complicated systems.

The following should be examined:

- power saving improvement,
- coordinated interception of non-required parts,
- disposition to power failure,
- priority control for avoiding overload,
- remote control of power supply,
- access server and remote terminal,
- improvement for EMC,
- ground scheme conforming to EMC standards.

d) Assessment guideline for multimedia contents

The stimulation of the senses by multimedia information equipment is one of the causes of nervous syndromes and other disorders. In order to prevent such disorders beforehand, it is necessary to consider a guideline for the design and operation of multimedia contents. The guideline should include the following issues:

- designing the expression of contents,
- operation for multimedia contents,
- designing human interfaces for multimedia contents.

Designing the expression of contents should discuss the influence of the volume (of speaker devices), brightness (of display units), etc. to the senses. Problematic methods of expressing content, such as subliminal messaging should also be addressed.

Operation of multimedia contents should discuss the restriction of users for particular content depending on the type of content and the method of such restriction.

Techniques for designing the human interface should discuss the standardization of warnings and alert icons as well as issues concerning children and the disabled.

Annex A

Digital TV broadcasting

A.1 Technical overview

Several analogue TV broadcasting systems such as NTSC, PAL, SECAM and their derivatives have actually been employed in the world. For digital TV broadcasting, regions and countries are introducing their own systems as shown in tables A.1 and A.2. Interactive services and data broadcasting are not yet provided commercially to any significant extent.

Table A.1 – Digital satellite broadcasting

	EU	USA-1	USA-2	Japan-1	Japan-2
Modulation	QPSK	QPSK	QPSK	QPSK	(8PSK)
Video	MPEG-ML	MPEG-ML,DC	MPEG-ML	MPEG-ML	MPEG-H/M
Audio	MPEG	MPEG/original	MPEG	MPEG	(MPEG)
Multiplex	DVB	original	DVB	DVB	(MPEG)
Video format	720*576	704*480	704*480	720*480	(1920*1080/720*480)
Picture rate	50i	60i	60i(60p)	60i/60p	(60i/60p)
NOTE 1 MPEG-ML, HL and H/M: Main level, High level, and High/Main level respectively.					
NOTE 2 Picture rate: the number of pictures in 1 s. "i" and "p" indicate interface and progressive respectively.					
NOTE 3 ( ): Under development.					

Table A.2 – Digital terrestrial broadcasting

	EU	USA	Japan
Modulation	OFDM	VSB	(OFDM)
Video	MPEG-M	based MPEG-H/M	(MPEG-H/M)
Audio	MPEG	AC3	(MPEG)
Multiplex	MPEG	MPEG	(MPEG)
Video format	720max*576	Free	(1920*1080/720*480)
Picture rate	50i	Free	60i(60p)
NOTE 1 MPEG-ML, HL and H/M: Main level, High level, and High/Main level respectively.			
NOTE 2 Picture rate: the number of pictures in 1 s. "i" and "p" indicate interface and progressive respectively.			
NOTE 3 ( ): Under development.			

A.2 Existing standardization

A few basic systems for digital broadcasting are recommended by the ITU, and a few more are described in the annexes of ITU recommendations. The ITU recommends the studio specification of 1920*1080 for the HD video format.

MPEG2 was standardized by ISO/IEC 13818. Its video coding scheme and multiplex system are used generally as shown in table A.1 and table A.2. The video formats and picture rates are different from each other and are not specified in a particular region. The data (e.g. EPG, copyright, censorship) relating to the programme and the use of SI are to be standardized.

The new project of IEC/TC 100, standardization of digital TV receivers, was accepted and has already started its activities.

A.3 User requirements

A.3.1 Broadcaster and contents provider

Formats for the content/programme should be standardized for international distribution. If few formats for standard definition and high definition are used, it is easy to distribute and convert one to another. The services they are intended to expand are not only TV or audio, but also multimedia services, including interactive. Receivers should penetrate the market rapidly for economic reasons.

A.3.2 End-user

Essentially the same receiver should be used everywhere in the world and be obtainable at a reasonable price. Easy operation, easy searching of the programmes, easy setting-up and connection of equipment and good picture and audio quality are the basic requirements, which are especially important in this digital era.

A.4 Examples of items needed for standardization for tomorrow

The format and the protocol for distribution of the programme content and the receiver platform are not yet standardized. The following are examples of standardization items for the future:

- the video formats for distribution and transmission;
- the details of SI/PSI and API especially for EPG, etc.;
- display

  Even if a format converter could be utilized at reasonable cost, it is better to standardize the video formats for display, i.e. pixels and the number of scanning lines of the display. It will be easy for the end-users to choose and the cost will be low. The possibility of using a personal computer for television reception can be improved, but the display format is not standardized and is different from that for digital television, thus causing confusion for both broadcasters and end-users;
- down-loadable structures of the digital TV receiver/STB;
- I/F between receivers, displays, STB, recording devices, etc.;
- GUI on the receiver and RCU (remote control unit).

NOTE Abbreviations:

- DVB Digital video broadcasting project in EU;
- EPG Electronic program guide;
- SI Service information;
- PSI Program specific information;
- STB Set-top box;
- GUI Graphical user interface.

Annex B

Internet broadcasting

B.1 Trends in Internet broadcasting

B.1.1 Definition

Digitization of graphics, compression/expansion technology, and the advance in computer capabilities has made the distribution of graphical, audio and textual information possible. Such distribution was not possible using traditional analogue broadcasting. Currently, Internet broadcasting refers to the service that distributes graphic and other information over the Internet. For instance, audio, video, and musical (MIDI data) information can be broadcast.

B.1.2 Broadcasting formats

There are generally two broadcasting formats: the "live format" and the "on-demand format". Table B.1 compares each of the formats.

Table B.1 – Formats of content distribution on the Internet

Format	Live	On demand
Broadcasting format	Digitizes and compresses current video/audio/etc. in real time and broadcasts them	Broadcasts as demanded graphics that were previously digitized, compressed, and saved
Network environment	When shooting at multiple locations, each location requires a network hook-up	Construct a network at the facility where the videos are stored. Film locations do not require a network set-up

B.1.3 Typical set-up for Internet broadcasting

Table B.2 shows the typical equipment and software used in Internet broadcasting, in this case for broadcasting video. Figure B.1 shows how the components connect together.

Table B.2 – Equipment necessary for Internet broadcasting

Name of component	Summary	Live	On-demand
Video recorder equipment	Equipment used to record images on location. Sends out analogue image signals using video cameras, industrial video cameras, etc.	Necessary	Unnecessary
Video player equipment	Equipment that reproduces images that have already been recorded and edited. Sends out analogue image signals using VCRs and industrial VCRs	Unnecessary	Necessary
Encoder	Digitizes and digitally compresses analogue image signals. Often uses a dedicated image compression board built into PCs. Two types of compression technology are used: MPEG, the standard image compression technology, and proprietary compression technology developed to achieve higher quality	Necessary	Necessary
Transmission server	Sends out real-time image data that was digitized by the encoder and image data that is transmitted from the storage server to Internet	Necessary	Necessary
Storage server	Stores digitized image data and transmits them in chronological packages as requested by the receiving computer. One server may serve as both the transmitter server and the storage server	Unnecessary	Necessary
Broadcast server	Processes the replay request to the storage server and the image data that is transmitted. Thus, it eases the request processing placed on the storage server and balances the transmission speed to Internet. This division of processes is often done on a separate server	Used as necessary	Used as necessary
Receiver client (receiver software)	The image data sent from the storage server/broadcast server is replayed on the screen of a computer that uses the receiving software designed for each Internet broadcasting technology	Necessary	Necessary

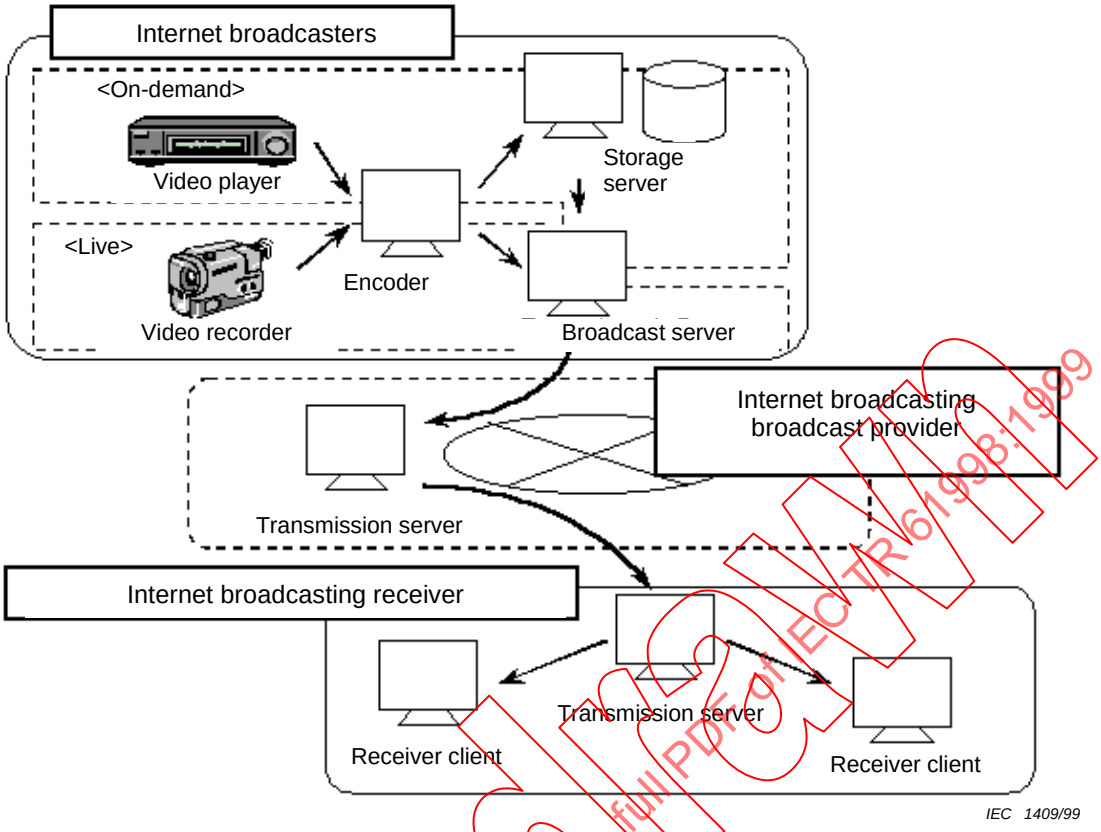

Figure B.1 – Internet broadcasting diagram

B.2 Actual broadcasting technology

Actual Internet broadcasting technologies are, for example, StreamWorks, VDOLive, and RealVideo. Their specifications are shown in table B.3.

Table B.3 – Major Internet broadcasting technologies

Broadcast engine	StreamWorks	RealVideo	VDOLive	Software vision	RealAudio (audio only)
Live distribution	Yes	Yes	Yes	Yes	Yes
On-demand distribution	Yes	Yes	Yes	Yes	Yes
Re-broadcast	Yes	Yes	Yes	Yes	–
Company	Xing technology	Progressive networks	VDOnet	NTT	Progressive networks
Image compression technology	MPEG1	RealVideo Codec (proprietary)	VideoWave Codec (Wavelet compression)	H. 261	–
Audio compression technology	MPEG Audio LBR	Dolby AC3	VideoWave Codec (Wavelet compression)	H.261	Dolby AC3
System set-up	Player Server Transmitter	Player Server	VDOLive On-demand, VDOLive broadcast	Player Distribution server Broadcast server	Server Encoder Player
Method of connecting server	Client-server model	Client-server model (Client-centric model)	Client-server model	Client-server model (Client-centric model)	Client-server model
Notes	Many broadcasting stations	Many broadcasting stations	Many broadcasting stations	Uses domestic Internet broadcasting technology	Many broadcasting stations

B.3 Regulation

Currently, RTP (Real Time Transport Protocol) is established as IETF RFC 1889 for use as the protocol for low-level transport layers responsible for the transfer of multimedia data. As its upper-layer protocol, RTSP (Real Time Streaming Protocol) has been suggested as RFC1889. It will be the standard protocol for one-on-many multimedia streaming that requires high-level control functions for license processing, etc.

B.4 Outlook

There are several key issues in making Internet broadcasting popular in common households:

- increase in network speed,
- improvement in compression technology and standardization of telecommunication protocols,
- popularization in personal computers and information appliances.

B.4.1 Increase in network speed

Currently, the upper limit of network speed in households is 128 kbps (using ISDN). However, in order to distribute video tape quality contents, 1,5 Mbps is necessary at the very least. Early realization of the optical highway project targeted to the year 2000 in some countries and the resulting low service costs are eagerly awaited.

An xDSL (ADSL, HDSL, or VSDL) is studied as the technology which will soon be able to realize the high speed (Mbps) digital transmission on existing metallic cables for telephone. Some evaluations and experiments for the xDSL are carried out, in particular, from such technical points of view as an attenuation by the transmission distance and a crosstalk of the signal wave.

B.4.2 Improvement in compression technology, standardization of telecommunication protocols

Due to recent improvements in compression technology, smoother and more colourful rendering of video clips is now possible, even on single-speed lines. Although further developments are being made, each company has its proprietary compression scheme and telecommunication protocol and there is no interoperability between them. In order to achieve high distribution in the market, early standardization is necessary.

B.4.3 Popularization in PCs and information appliances

A certain amount of Internet broadcasting occurs today on personal computers, and will spread further in the coming years. However, in order to make it more widespread, the conditions listed above need to be met, and emphasis should be placed on distribution to the home. Ideally, it would be added as a standard feature on televisions, fax machines, and other information appliances.

Annex C

Cable TV

C.1 Standardization of digital broadcasting systems crossing many kinds of media

Table C.1 – Layered structure of cable TV systems

	Functionality	Standards
Layer 7	CATV services	
Layer 6	Information coding: MPEG 2	MPEG 2 systems (ITU-T H.220.0, ISO/IEC 13818)
Layer 5	Data group (PES) construction/divide	ARIB (Association Radio Industry and Broadcast)
		JCTEA (Japanese Cable TV Engineers Association)
Layer 4	PSI (Program Specific Information) transmission TS packet	
Layer 3	Conditional access	MULTI 2 (ISO 9979/009)
	Descramble/encoding, multi-program: MUX	
Layer 2	Baseband framing, error correction	Telecom engineering committee in MPT
Layer 1	Terrestrial (OFDM), satellite (QPSK), cable (64QAM)	Telecom engineering committee in MPT
		ITU-T Rec.J83, Digital Multi Program System for Television
	Physical/CATV networks	IEC 60728 series

Annex D

Display interface

D.1 Two types of display systems

There are two types of display systems, one for computer and the other for television (TV).

a) Display for computer

The display system for a computer is usually composed of the following components as shown in figure D.1a.

Display device
A physical device, such as a cathode ray tube (CRT) or a liquid crystal display (LCD), for displaying text, graphics or video.

Display unit
A display unit consists of a display device and an electronic circuit.

Display adapter
A display adapter within a computer converts the digital signal to an analogue video signal accepted by the display unit.

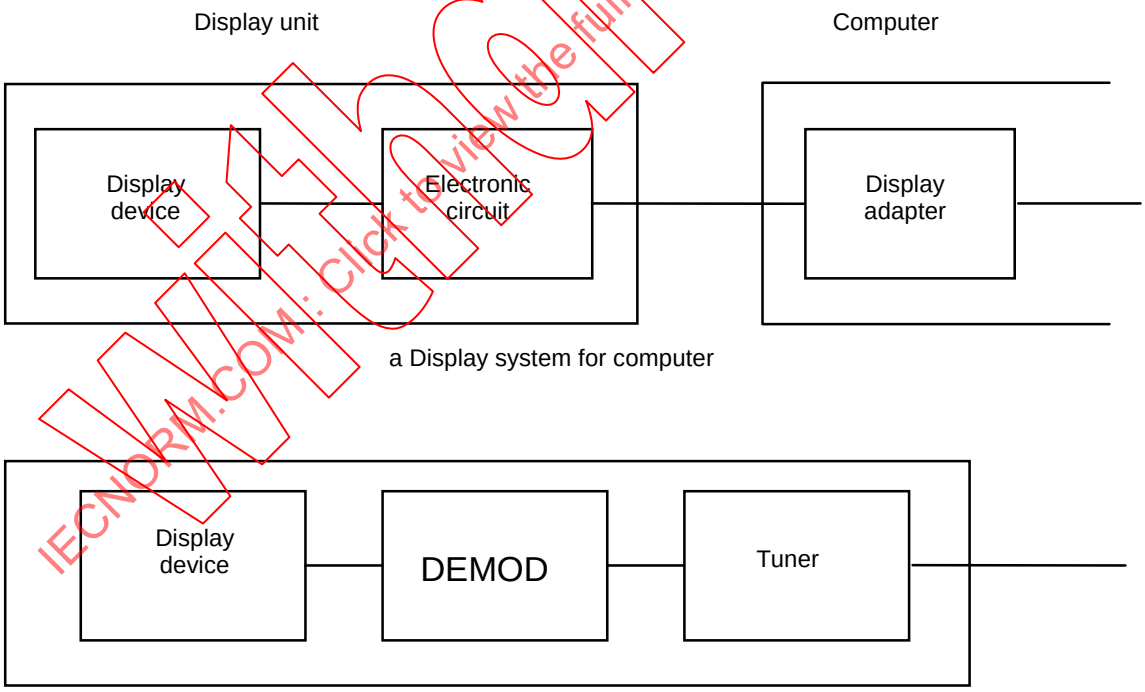

Figure D.1 – Display systems

b) Display for television

The display system for a TV set is composed of a display device, a tuner and a demodulator (DEMOD) as shown in figure D.1b. The video signals for the display device are supplied by the tuner and the demodulator.

In the past, the consumer markets of TV sets and computers were separated and the components constituting each device had not been differentiated in use. Since computers have today come into wide use in the home, as well as TV, user requests are increased to make common use of the display functionality of the TV set and display unit for computers.

D.2 Status of standardization

A variety of television systems are recognized as standard by ITU-R. Table D.1 shows data extracted from the ITU-R Rep.624-4, which shows that 10 TV systems are now used in the world. This results in differences in the production cost of TV sets, depending on the market size for each system.

Table D.1 – Television systems

Television system	Number of lines	Field frequency	Comments
NTSC (National Television System Committee)	525	60	The picture is broadcast using amplitude modulation and the sound using frequency modulation; used in the USA, Central America, and Japan
PAL (Phase Alternation Line)	625	50	Clearer image than NTSC and is used in most of Europe, except for France
SECAM (Système Électronique Couleur Avec Mémoire)	625	50	Provides a better image than either PAL or NTSC and is used in France and Eastern Europe

For personal computers, we find a more confused situation in display system standards. Table D.2 shows the standards for the video signal to the display device. This standard is *de facto* and established by the particular PC vendor who had the most influence on the PC market. Whenever the vendor released a new model of PC, a video specification for the new model was added to the standard.

Table D.2 – Video standard for a personal computer

Video standard	Feature	Resolution	Refresh rate Hz	Horizontal scan frequency kHz	Backward compatibility
MDA(1981)	Text, Monochrome	720 × 350	50	18.43	–
CGA(1981)	Text, 16 Colours	640 × 200	60	15.75	–
	Text, 16 Colours	320 × 200	60	15.75	–
	Text, 16 Colours	160 × 200	60	15.75	–
	Graphics, 4 Colours	320 × 200	60	15.75	–
	Graphics, 2 Colours	640 × 200	60	15.75	–
HGC(1982)	Text, Monochrome	720 × 350	50	18.1	MDA
	Graphics, Monochrome	720 × 348	50	18.1	MDA
EGA(1984)	Text, 16 Colours	640 × 350	60	21.85	CGA, MDA
	Text, 4 Colours	720 × 350	60	21.85	CGA, MDA
	Graphics, 16 Colours	640 × 350	60	21.85	CGA, MDA
	Graphics, 16 Colours	320 × 200	60	21.85	CGA, MDA
	Graphics, 16 Colours	640 × 200	60	21.85	CGA, MDA
	Graphics, 16 Colours	640 × 350	60	21.85	CGA, MDA
PGA (1987)	Graphics, 256 Colours	640 × 480	60	30.5	CGA
VGA (1987)	Text, 16 Colours	720 × 400	70	31.5	CGA, EGA
	Text, 16 Colours	360 × 400	70	31.5	CGA, EGA
	Graphics,16 Colours	640 × 480	60	31.5	CGA, EGA
	Graphics, 2 Colours	640 × 480	60	31.5	CGA, EGA
	Graphics, 256 Colours	370 × 200	70	31.5	CGA, EGA
MCGA (1987)	Text, 4 Colours	320 × 400	70	31.5	CGA, EGA
	Text, 2 Colours	640 × 400	70	31.5	CGA, EGA
	Graphics, 2 Colours	640 × 480	60	31.5	CGA, EGA
	Graphics, 256 Colours	320 × 200	70	31.5	CGA, EGA
Super VGA(VESA)	Graphics, 16 Colours	800 × 600	56,60,72	35.0,37.6,48.0	VGA, CGA, EGA
8514/A (1987)	Graphics, 16 Colours	1024 × 768	43.48	35.52	VGA Pass Through
	Graphics, 256 Colours	640 × 480	43.48	35.52	VGA Pass Through
	Graphics, 256 Colours	1024 × 768	43.48	35.52	VGA Pass Through
XGA (1990)	Graphics, 256 Colours	640 × 480	43.48	35.52	VGA
	Graphics, 256 Colours	1024 × 768	43.48	35.52	VGA
	Graphics, 65,535 Colours	640 × 480	43.48	35.52	VGA
	Text, 16 Colours	1056 × 400	43.48	35.52	VGA

In recent years, this standardization process has been corrected and VESA (Video Electronics Standards Association) composed of several PC vendors, has a role of standardization and authorization. Certainly multi-sync display devices which are able to display several types of video standard, have been developed mainly for business use.

D.3 User requirements and subjects

Users expect new services by convergence of communication and broadcasting services. They have no concerns about the display system in itself, and want to make common use of the display system between TV set and PC. In order to make common use of the display system, there may be many technical problems, one of which being how to decide on one or more display resolutions, because we have no grounds for choosing particular resolutions in the current confused situation regarding display systems.

In the near future, digital display devices, such as LCD, are expected to become more popular than CRT because of compactness and adaptability to digital video. But there are no standards for digital video signal to be used for LCD display interfaces. Several vendors of LCD display units have already released LCD display devices with non-standardized physical and electrical interfaces.

D.4 Recommendation

This report surveyed the current status of standardization for display systems. There are two types of display systems, one for television and the other for personal computers. We found that there were 10 analogue TV systems in use, and that there were many standards for video signals for computers. Both have confused the display unit vendors.

For computers, the image resolutions were decided by the cost of image memory or semiconductor processing techniques. There were no discussions on the image resolutions from the viewpoint of services or users. Certainly it may be difficult to decide on one or more resolutions for PC display, unlike TV display, but some profiles should be shown to the market according to the applications.

In the future, where communication and broadcasting services are converged, some components of TV sets and computers should be used as common devices. A new standard, for a new multimedia device, should be established quickly, so as to avoid confusion because of the promotion of several specifications.

Annex E

Picture coding

E.1 Digital image coding

With the progress of advanced digital technologies and the fusion of information, communications, and visual media, the multimedia market has emerged and is expected to show rapid growth.

This paper introduces the concepts of aims in the digital image coding of a large range for multimedia applications. Figure E.1 shows an overview of digital image coding standards and transmission bit rate.

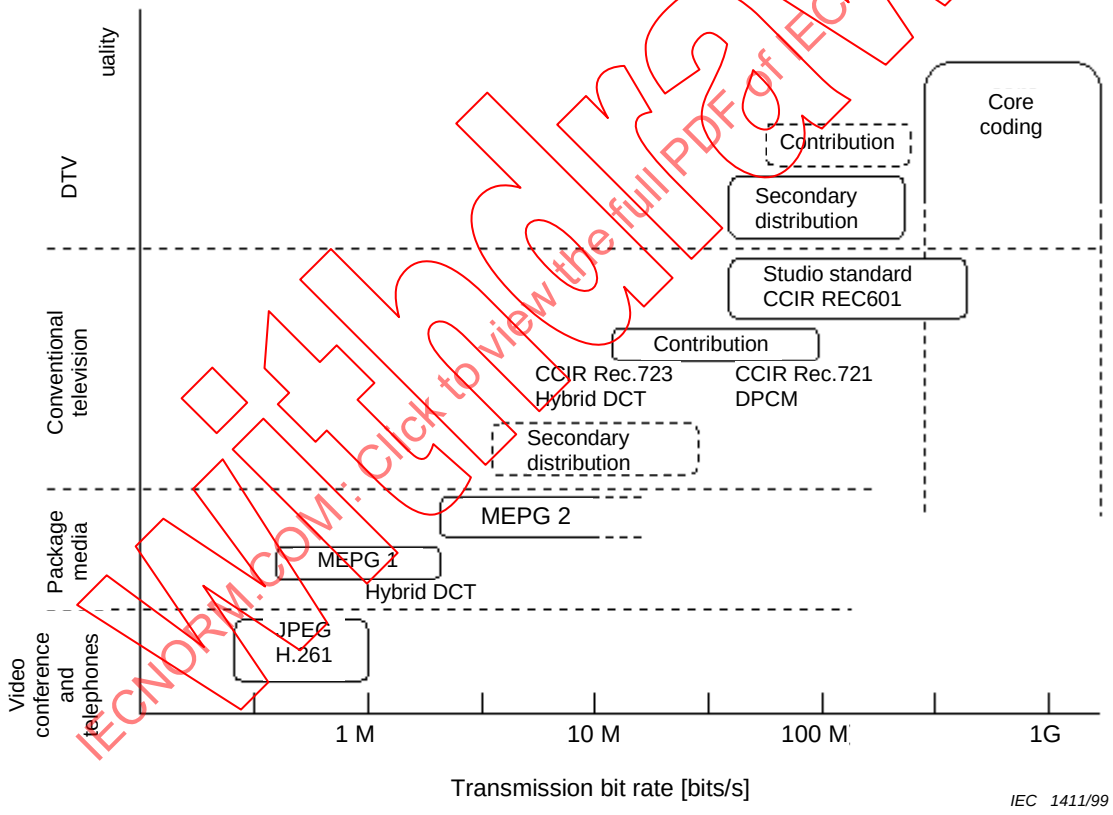

Figure E.1 – Classification of digital image coding schemes

Concerning coding methods to compress the information to be recorded, MPEG1 and MPEG2 are being studied for moving images and JPEG is being studied for still image on storage media.

E.2 Application

In recent years, the use of multimedia data has been steadily spreading in many fields.

In the high-quality audio-visual field, DVD, satellite digital broadcasting and digital documents have been launched. These applications are realized by means of picture compression technology.

The system configuration and field applications are shown in figure E.2. The eight circles of each medium represent the most important multimedia fields.

In view of this situation, new image coding will become the core of such technology and will play a leading role in the multimedia industry.

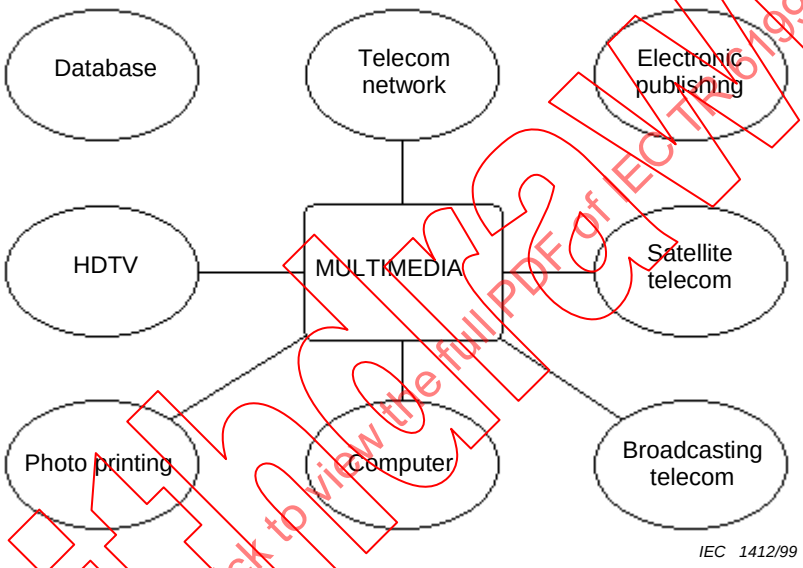

Figure E.2 – Multimedia application fields

E.3 User requirements

The digital image coding should be able to increase the compression ratio and secure high image quality.

In addition, the coding should

a) be highly consistent with a standard coding algorithm;
b) secure freedom in order to respond to various uses;
c) correspond to both still and motion images;
d) correspond to picture format changes;
e) meet other stipulated requirements.

E.4 Study issues of core image coding

The ideal integrated coding method would be one based on a core coding algorithm to which new functions could be added. Development of a new algorithm is expected in the near future. The above-mentioned core coding using multimedia is shown in figure E.3.

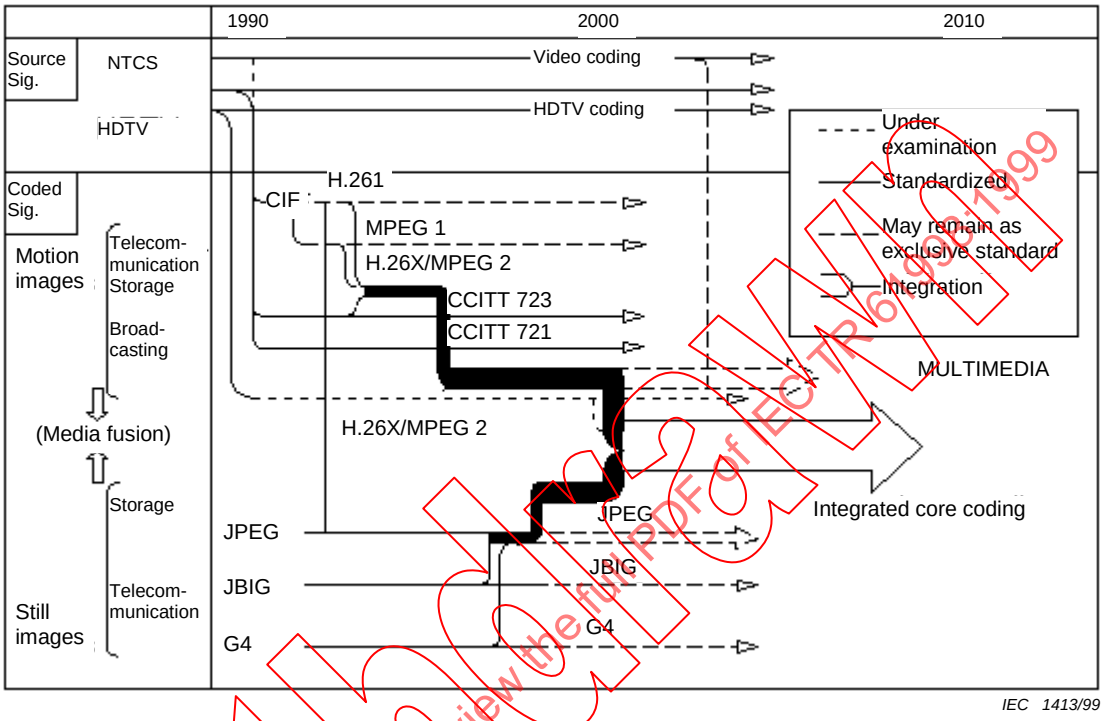

Figure E.3 – Core image coding

Annex F

Video game contents

F.1 Games machine market

The games machine market has the following features.

a) Small value of hardware

The value of games depends on the software, but not on the hardware. Users select games programmes without considering the machine specification.

b) Low machine price

Games machines have custom functions only for games in order to realize low cost, especially 3D presentation and real sound abilities.

c) User interface

Limited equipment, joystick or similar, realizing multiple functions.

F.2 Relation to games software

Games software should realize the best performance possible with limited minimum functions. Software depends on the machine specification, and their relation is very close. The games market is dependent upon popularity. New games demand new functions, and this is the best reason to change hardware specifications. With this background, there are few reasons for the game vendor to adopt an open policy.

The PC market, however, is growing more and more powerful and low-price machines realizing high specifications of presentation and sound are available. The PC games software market using these multimedia PCs is also growing. These environments have open standards and realize open software environments.

F.3 Distribution of games software

Games software can be distributed by any kind of medium, especially satellite or digital TV. Specifications for distribution software using satellite digital broadcasting are being studied. For example Microsoft disclosed the specifications OSD (Open Software Description) for software distribution format based on XML (Extensible Markup Language). This group may contribute to the standard body.

Specifications for use on cable TV were implemented in US and Japan. SEGA corporation developed the specification. In this case, special equipment, a dividing unit on the cable, is required. These specifications are not open and use is limited, and they are not expected to be standardized.

F.4 Developing environment

Recently there has been development of computer graphics for games used in workstation environments. NINTENDO 64s CG was developed by INDY of SGI (Silicon Graphics Inc.). This environment will be widely used by games developers.

Home games machines have custom chips for CG and digital sound. To convert software to a target machine, custom tools are required, i.e. ICE (Incircuit Emulator). These conversion methods are not standardized.

F.5 Standardization activities

There are no international standards and activities for home games machines and game software. Games vendors seem to be eager to have *de facto* standards for their proprietary specifications rather than international standard activities. They are using PC standards, interface and media for their games machines.

F.6 User requirements

End-user/consumer, game player:

- unified user interface
- connectivity to equipment, i.e. joystick
- interoperability to other games machines
- connectivity to PCs and home equipment

Software developer:

- development language
- format

F.7 Future work

The computer market has expanded to a bigger market by adopting standards. There are still requirements for some standardization for games consoles for home use. For example, developing a small operating system for home computer or a game application or system interface may be an opportunity for standardization for games machine for market expansion.

Standards for game systems are expected to promote machine independency of games. Game machine users would like game software to be portable from one manufacturer's machines to another's.

F.8 Potential issues for game systems

- interface
- user interface
- media
- software distribution
- developing environment

Annex G

Video games equipment

G.1 Current status

Games software creations are classified into the three types shown in table G.1. Regarding hardware for game equipment, each vendor creates its specific equipment, based on its own strategy.

Table G.1 – Structure of the video game industry

Soft creation	Soft production	Distribution style
(1) Create by oneself	External production by CD-ROM	Distributors/convenience store (CVS)
(2) External supplier	In-house production by CD-ROM	Route by oneself/distributors/CVS
(3) In-house and limited supplier	Production by order by MASK ROM	Distributors/CVS (business writing memory)

G.2 Standardization status

Both hardware and software do not have compatibility in the present video games market.

G.3 Application deployment

It is expected that video games may be merged into PC, Internet or another new multimedia market. When that happens, the market may demand unified specifications or standards for the video games market.

G.4 User requirements

Almost all users need the convenience of interoperability.

G.5 Optimum situation

Show two cases from different points of view.

G.5.1 Software

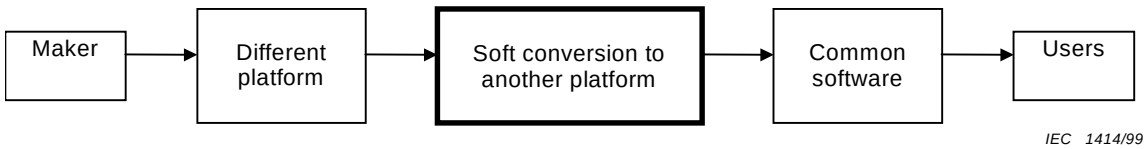

Figure G.1 – Video game software distribution

Software conversion to another platform

a) Users who want to convert to another platform pay the charge.
b) Be organized by a joint contribution of related industry consortia.

G.5.2 Hardware

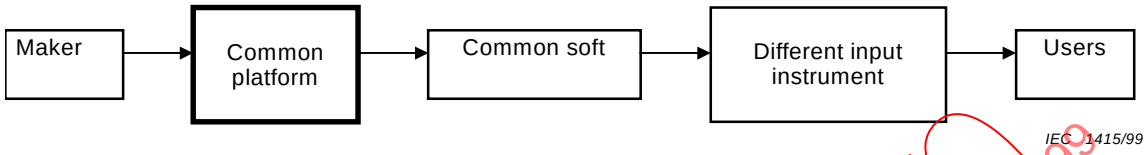

Figure G.2 – Video game hardware distribution

Though hardware must act as a common platform, a distinction between competitors may be made by input instruments.

G.6 Benefits and problems

G.6.1 Benefits

User's side

Can use all software without depending on the manufacturers.

Manufacturer's side

Can focus on software resources better than at the present time.

G.6.2 Problems

- May reduce software quality.
- May become difficult to compete successfully due to common software or hardware.
- Need for a review of the distribution route by each manufacturer.
- Concern over the development of the video games market.
- Games software surplus overflows.

Annex H

Existing standardization activity on multimedia technology

International and national standardization groups have already worked on their issues of interest for multimedia technology. In order to avoid a technical duplication between IEC/TC 100 and other groups' activities, table H.1 clarifies the major existing standardization activities taken by ITU, JTC 1, IEEE, etc.

Table H.1 – Existing standardization activity

Theme	Classification	Subject	Standard number	Status	Body	TC/SC/WG/SG
Language	Multimedia document	SGML	ISO 8879	1986	ISO/IEC	JTC 1/SC 18/WG 8
		XML	REC-xml-19980210	1998	W3C	
		HTML	ISO/IEC 15445	DIS	ISO/IEC	JTC 1/SC 34
		DSSSL	ISO/IEC 10179	1996	ISO/IEC	JTC 1/SC 18/WG 8
		XSL		WD	W3C	
		CSS	REC-css1-961217	1996	W3C	
		SPDL	ISO/IEC 10180	1995	ISO/IEC	JTC 1/SC 18/WG 8
		Font Info Interchange	ISO/IEC 9541-1 ISO/IEC 9541-2	1991	ISO/IEC	JTC 1/SC 18/WG 8
		HyTime	ISO/IEC 10744	1997	ISO/IEC	JTC 1/SC 18/WG 8
		Topic map	ISO/IEC 13250	DIS	ISO/IEC	JTC 1/SC 34
		SMIL	REC-smil-19980615	1998	W3C	
		SMDL	ISO/IEC 10173	1998	ISO/IEC	JTC 1/SC 18/WG 8
	Object oriented	JAVA script	ISO/IEC 16262	1998	ISO/IEC	JTC 1
		JAVA language/beans		PAS	ISO/IEC	JTC 1
	Multimedia/ hypermedia	MHEG 1 (object)	ISO/IEC 13522-1	1997	ISO/IEC	JTC 1/SC 29/WG 12
		MHEG 3 (format)	ISO/IEC 13522-3	1997	ISO/IEC	JTC 1/SC 29/WG 12
		MHEG 4 (regist)	ISO/IEC 13522-4	1996	ISO/IEC	JTC 1/SC 29/WG 12
		MHEG 5 (VoD)	ISO/IEC 13522-5	1997	ISO/IEC	JTC 1/SC 29/WG 12
		MHEG 6 (Java)	ISO/IEC 13522-6	1998	ISO/IEC	JTC1 /SC 29/WG 12

Table H.1 – Existing standardization activity *(continued)*

Theme	Classification	Subject	Standard number	Status	Body	TC/SC/WG/SG
Contents coding	Bi-level still image	JBIG lossy	ISO/IEC 11544	1993	ISO/IEC	JTC 1/SC 29/WG 1
		JBIG lossy/lossless	ISO/IEC 14492	CD	ISO/IEC	JTC 1/SC 29
	Still image	JPEG lossy	ISO/IEC 10918-4	DIS	ISO/IEC	JTC 1/SC 29
		JPEG lossy/lossless	ISO/IEC 14495	DIS	ISO/IEC	JTC 1/SC 29
		JPEG2000	ISO/IEC 15444	WD	ISO/IEC	JTC 1/SC 29
		TIFF/IT	ISO 12639	1998	ISO	TC 130/WG 2
		GIF	Non-pub STD			CompuServe
	Fax image	MMR (G4)	ITU-T T.6		1984	ITU-T/SG VIII
		MR (G3)	ITU-T T.x		198x	ITU-T/SG VIII
	Moving picture	MPEG 1 (1,5 Mbps)	ISO/IEC 11172		ISO/IEC	JTC 1/SC 29/WG 11
		MPEG 2 (high bitrate)	ISO/IEC 13818		ISO/IEC	JTC 1/SC 29
		MPEG 4 (low bitrate)	ISO/IEC 14496		ISO/IEC	JTC 1/SC 29
	C. graphics	CGM	ISO/IEC 8632	1992	ISO/IEC	JTC 1/SC 24
		PHIGS	ISO/IEC 9592-1	1997	ISO/IEC	JTC 1/SC 24
	Music	MIDI				AMEI/MMA
Communication	B-ISDN	ATM signalling requirement/protocol	Q series	–	ITU-T	SG 13
		ATM general network aspects/UNI,GII	I,G series	–	ITU-T	SG 11
		ATM multimedia service/systems	H series	–	ITU-T	SG 16
	LAN	ATM user network I/F	UNI 4.0	1996	ATM Forum	SIG
		MPEG over ATM	VOD 1.1	1997	ATM Forum	SAA
		Voice and telephony over ATM	VTOA	1997	ATM Forum	SAA
		ATM data exchange I/F	DXI 1.0	1993	ATM Forum	
		High-level layer I/F	IEEE 802.1		IEEE	802/WG 1
		Logical link control	IEEE 802.2	1984	IEEE	802/WG 2
		Ethernet CMSA/CD	IEEE 802.3	1996	IEEE	802/WG 3
		Token bus	IEEE 802.4	1990	IEEE	802/WG 4
		Token ring	IEEE 802.5	1998	IEEE	802/WG5
		Wireless LAN	IEEE 802.11	1997	IEEE	802/WG11
		FDDI			ANSI	X3/T12
		HIPPI/fibre channel			ANSI	X3/T11
	IP	Protocol	RFC768	1980	IETF	
		Internet protocol	RFC791	1981	IETF	
		Transmission protocol	RFC793	1981	IETF	

Table H.1 – Existing standardization activity *(continued)*

Theme	Classification	Subject	Standard number	Status	Body	TC/SC/WG/SG
		Simple mail transfer protocol	RFC821	1982	IETF	
		Telnet protocol	RFC854	1983	IETF	
		File transfer protocol	RFC959	1985	IETF	
		Routing information protocol	RFC1058	1988	IETF	
		Simple network management protocol	RFC1157	1990	IETF	
		MIME:Multipurpose Internet Mail Ext	RFC1341	1992	IETF	
		RTP:Transfer Prot for R-Time Appl	RFC1889	1996	IETF	
		HTTP:HyperText Transfer Protocol	RFC2068	1997	IETF	
Broadcasting	Sound	Systems for terrestrial in 30 M-3 GHz	BS.1114-1	1995	ITU-R	SG 10
		Service requirement in UHF/VHF	BS.774-2	1995		
		Systems for satellite in 1,4-2,7 GHz	BO.1130-1	1995		
	Television	Terrestrial broadcast	Report624		ITU-R	SG 11
		Satellite broadcast	Report1073		ITU-R	SG 11
		Data service in digital terrestrial TV	BT.1301-0	1997	ITU-R	SG 11
		Interactive service		just started	ITU-R	SG 11
	Cable	Digital transmission	J.83	1995	ITU-T	SG 9
		I/F specifications for data over cable	J.112	1998	ITU-T	SG 9
Application	VOD	Video on demand	DAVIC 1.0		DAVIC	
			DAVIC 1.1	CD	DAVIC	
Package	Mag-tape	R-DAT,DCC				DAT Cons
		D-1,2,3,5,6				SMPTE
		Digital beta cam				SMPTE
		1/4"DV	IEC 61834	FDIS	IEC	TC 100/SC 100B
		3,81 mm MTC helical scan DDS-3	ISO/IEC 15521	1998	ISO/IEC	JTC 1/SC 11
		8 mm MTC helical scan AIT-1	ISO/IEC 15780	DIS	ISO/IEC	JTC 1/SC 11
		12,7 mm MTC helical scan DTF-1	ISO/IEC 15731	1998	ISO/IEC	JTC 1/SC 11
	Flex-disc	3,5" 10 MB	ISO/IEC 13422	1994	ISO/IEC	JTC 1/S 11
		ZIP	Non-pub STD			IO Mega
		Vol/file format	ISO/IEC 9293	1994	ISO/IEC	JTC 1/SC 15
	CD	CD audio system	IEC 60908	1999	IEC	TC 100/SC 100B
		Photo CD	Non-pub STD			Kodak
		CD-ROM	ISO/IEC 10149	1995	ISO/IEC	JTC 1/SC 23

Table H.1 – Existing standardization activity *(continued)*

Theme	Classification	Subject	Standard number	Status	Body	TC/SC/WG/SG
	PD	PD	ISO/IEC 15485	1997	ISO/IEC	JTC 1/SC 23
	MD	MD audio	IEC 61909	CDV	IEC	TC 100/SC 100B
	DVD	120 mm RO	JIS X 6241	1997	JISC	OITDA
	90 mm ODC	128M RW	ISO/IEC 10090	1992	ISO/IEC	JTC 1/SC 23
		230M RW	ISO/IEC 13863	1998	ISO/IEC	JTC 1/SC 23
		640M RW	ISO/IEC 15041	1997	ISO/IEC	JTC 1/SC 23
		650M RW	ISO/IEC 15498	1997	ISO/IEC	JTC 1/SC 23
		1,3G PC RW	ISO/IEC 14760	1997	ISO/IEC	JTC 1/SC 23
	130 mm ODC	650M WO	ISO/IEC 9171	1990	ISO/IEC	JTC 1/SC 23
		650M RW	ISO/IEC 10089	1991	ISO/IEC	JTC 1/SC 23
		650M WO	ISO/IEC 11560	1992	ISO/IEC	JTC 1/SC 23
		1G RW	ISO/IEC 13481	1993	ISO/IEC	JTC 1/SC 23
		1,3G RW	ISO/IEC 13549	1993	ISO/IEC	JTC 1/SC 23
		2G RW	ISO/IEC 13842	1995	ISO/IEC	JTC 1/SC 23
		2,6G WO	ISO/IEC 14517	1996	ISO/IEC	JTC 1/SC 23
		2.6G WO	ISO/IEC 15486	1998	ISO/IEC	JTC 1/SC 23
		5.,G RW	ISO/IEC 15286	1999	ISO/IEC	JTC 1/SC 23
	300mm ODC	12G WO	ISO/IEC 13614	1995	ISO/IEC	JTC 1/SC 23
		12G WO	ISO/IEC 13403	1995	ISO/IEC	JTC 1/SC 23
	356mm ODC	14,8/25G WO	ISO/IEC 15898	DIS	ISO/IEC	JTC 1/SC 23
	Vol/file format	CD-ROM	ISO 9660	1988	ISO	JTC 1/SC 15
		RW, WO, RO	ISO/IEC 13346	1995	ISO/IEC	JTC 1/SC 15
		CD, WO, RO	ISO/IEC 13490	1995	ISO/IEC	JTC 1/SC 15
	V/f profile	DVD.	JIS X 0609	1998	JISC	OITDA
		DVD-RO	JIS/TR X 0006	1998	JISC	OITDA
Colour		Colorimetry spec	CIE 15.2	1986	CIE	
		Colour measurement	IEC 61966		IEC	TC 100
		Spectral measurement	ISO 13655	1996	ISO	TC 130
		Colour FAX	ITU-T T.42	1995	ITU	
		Scanner calibration	ISO 12641	1997	ISO	TC 130
		Electric still camera OECF	ISO 14524	DIS	ISO	TC 42
		SCID	ISO 12640	1997	ISO	TC 130
Interface	Infra-red communication	Serial infrared	IrDA-SIR:ver1.0	1994	IrDA	
			IrDA-SIR:ver1.1	1995	IrDA	
			IrDA-SIR:ver1.2	1997	IrDA	

Table H.1 – Existing standardization activity *(continued)*

Theme	Classification	Subject	Standard number	Status	Body	TC/SC/WG/SG
		Link access protocol	IrLAP	1994	IrDA	
		Link manage protocol	IrLMP	1994	IrDA	
		Tiny transport protocol	Tiny TP	1995	IrDA	
		Infra-red transfer protocol	InTran-P	1997	IrDA	
	Peripherals interface	Audio/video interface	IEC 61883	1998	IEC	TC 100/SC 100C
		FireWire	IEEE 1394	1995	IEEE	
		SCSI	ISO/IEC 9316	1995	ISO/IEC	JTC 1/SC 13