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Part 6: Information representation

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Partie 6: Représentation des informations

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 734 10 79
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Web www.iso.ch

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 16500 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 16500-6 was prepared by DAVIC (Digital Audio-Visual Council) and was adopted, under the PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

ISO/IEC 16500 consists of the following parts, under the general title *Information technology — Generic digital audio-visual systems*:

— *Part 1: System reference models and scenarios*

— *Part 2: System dynamics, scenarios and protocol requirements*

— *Part 3: Contours: Technology domain*

— *Part 4: Lower-layer protocols and physical interfaces*

— *Part 5: High and mid-layer protocols*

— *Part 6: Information representation*

— *Part 7: Basic security tools*

— *Part 8: Management architecture and protocols*

— *Part 9: Usage information protocols*

Annexes A to G form a normative part of this part of ISO/IEC 16500. Annexes H to P are for information only.

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Introduction

ISO/IEC 16500 defines the minimum tools and dynamic behavior required by digital audio-visual systems for end-to-end interoperability across countries, applications and services. To achieve this interoperability, it defines the technologies and information flows to be used within and between the major components of generic digital audio-visual systems. Interoperability between these components and between individual sub-systems is assured through specification of tools and specification of dynamic systems behavior at defined reference points. A reference point can comprise one or more logical (non-physical) information-transfer interfaces, and one or more physical signal-transfer interfaces. A logical interface is defined by a set of information flows and associated protocol stacks. A physical interface is an external interface and is fully defined by its physical and electrical characteristics. Accessible reference points are used to determine and demonstrate compliance of a digital audio-visual subsystem with this international standard.

A summary of each part follows.

ISO/IEC 16500-1 (DAVIC 1.3.1a Part 2) defines the normative digital audio-visual systems technical framework. It provides a vocabulary and a Systems Reference Model, which identifies specific functional blocks and information flows, interfaces and reference points.

ISO/IEC 16500-2 (DAVIC 1.3.1a Part 12) defines system dynamic behavior and physical scenarios. It details the locations of the control functional entities along with the normative protocols needed to support the systems behavior. It is structured as a set of protocol walk-throughs, or *"Application Notes"*, that rehearse both the steady state and dynamic operation of the system at relevant reference points using specified protocols. Detailed dynamics are given for the following scenarios: video on demand, switched video broadcast, interactive broadcast, and internet access.

ISO/IEC 16500-3 (DAVIC 1.3.1a Part 14) provides the normative definition of DAVIC Technology Contours. These are strict sets of Applications, Functionalities and Technologies which allow compliance and conformance criteria to be easily specified and assessed. This part of ISO/IEC 16500 contains the full details of two contours. These are the Enhanced Digital Broadcast (EDB) and Interactive Digital Broadcast (IDB). ISO/IEC 16500-3 specifies required technologies and is a mandatory compliance document for contour implementations.

ISO/IEC 16500-4 (DAVIC 1.3.1a Part 8) defines the toolbox of technologies used for lower layer protocols and physical interfaces. The tools specified are those required to digitize signals and information in the Core Network and in the Access Network. Each tool is applicable at one or more of the reference points specified within the Delivery System. In addition a detailed specification is provided of the physical interfaces between the Network Interface Unit and the Set Top Unit and of the physical interfaces used to connect Set Top Boxes to various peripheral devices (digital video recorder, PC, printer). The physical Delivery System mechanisms included are copper pairs, coaxial cable, fiber, HFC, MMDS, LMDS, satellite and terrestrial broadcasting.

ISO/IEC 16500-5 (DAVIC 1.3.1a Part 7) defines the technologies used for high and mid-layer protocols for ISO/IEC 16500 digital audio-visual systems. In particular, this part defines the specific protocol stacks and requirements on protocols at specific interfaces for the content, control and management information flows.

ISO/IEC 16500-6 (DAVIC 1.3.1a Part 9) defines what the user will eventually see and hear and with what quality. It specifies the way in which monomedia and multimedia information types are coded and exchanged. This includes the definition of a virtual machine and a set of APIs to support interoperable exchange of program code. Interoperability of applications is achieved, without specifying the internal design of a set top unit, by a normative Reference Decoder Model which defines specific memory and behavior constraints for content decoding. Separate profiles are defined for different sets of multimedia components.

ISO/IEC 16500-7 (DAVIC 1.3.1a Part 10) defines the interfaces and the security tools required for an ISO/IEC 16500 system implementing security profiles. These tools include security protocols which operate across one or both of the defined conditional access interfaces CA0 and CA1. The interface CA0 is to all security and conditional access functions, including the high speed descrambling functions. The interface CA1 is to a tamper resistant device used for low speed cryptographic processing. This cryptographic processing function is implemented in a smart card.

ISO/IEC 16500-8 (DAVIC 1.3.1a Part 6) specifies the information model used for managing ISO/IEC 16500 systems. In particular, this part defines the managed object classes and their associated characteristics for managing the access network and service-related data in the Delivery System. Where these definitions are taken from existing standards, full reference to the required standards is provided. Otherwise a full description is integrated in the text of this part. Usage-related information model is defined in ISO/IEC 16500-9.

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ISO/IEC 16500-9 (DAVIC 1.3.1a Part 11) specifies the interface requirements and defines the formats for the collection of usage data used for billing, and other business-related operations such as customer profile maintenance. It also specifies the protocols for the transfer of Usage Information into and out of the ISO/IEC 16500 digital audio-visual system. In summary, flows of audio, video and audio-visual works are monitored at defined usage data collection elements (e.g., servers, elements of the Delivery System, set-top boxes). Information concerning these flows is then collected, processed and passed to external systems such as billing or a rights administration society via a standardised usage data transfer interface.

Additional Information

ISO/IEC TR 16501 is an accompanying Technical Report. Further architectural and conformance information is provided in other non-normative parts of DAVIC 1.3.1a (1999). A summary of these documents is included here for information.

ISO/IEC TR 16501 (DAVIC 1.3.1a Part 1) provides a detailed listing of the functionalities required by users and providers of digital audio-visual applications and systems. It introduces the concept of a contour and defines the IDB (Interactive Digital Broadcast) and EDB (Enhanced Digital Broadcast) functionality requirements which are used to define the normative contour technology toolsets provided in ISO/IEC 16500-3.

DAVIC 1.3.1a Parts 3, 4 and 5 are DAVIC technical reports. They provide additional architectural and other information for the server, the delivery-system, and the Service Consumer systems respectively. Part 3 defines how to load an application, once created, onto a server and gives information and guidance on the protocols transmitted from the set-top user to the server, and those used to control the set-up and execution of a selected application. Part 4 provides an overview of Delivery Systems and describes instances of specific DAVIC networked service architectures. These include physical and wireless networks. Non-networked delivery (e.g., local storage physical media like discs, tapes and CD-ROMs) are not specified. Part 5 provides a Service Consumer systems architecture and a description of the DAVIC Set Top reference points defined elsewhere in the normative parts of the specification.

DAVIC 1.3.1a Part 13 is a DAVIC technical report, which provides guidelines on how to validate the systems, technology tools and protocols through conformance and / or interoperability testing.

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Information technology — Generic digital audio-visual systems — Part 6: Information representation

1. Scope

This part of ISO/IEC 16500 takes a practical approach to the specification of Information Representation. Just the information types that cannot be dispensed with in producing the set of DAVIC applications (viz. broadcast, movies on demand, home shopping, etc.) are specified. The approach taken in this part of ISO/IEC 16500 starts by defining the various monomedia information types. They include character, text, fonts, service information, audio, video, and graphics. Consistent with DAVIC principles, one tool is selected for the encoding of each information type. Multimedia components comprise one or more monomedia components. This part of ISO/IEC 16500 defines the way in which multimedia information is coded and exchanged. This includes the definition of a virtual machine and a set of APIs to support interoperable exchange of program code. Finally, this part of ISO/IEC 16500 defines a Reference Decoder Model for contents decoding which provides constraints on content. The major problem addressed by the model is to ensure interoperability of applications by specifying memory and behaviour constraints for contents decoding by a hypothetical STU, without specifying the internal design of an STU. An application built according to the reference decoder model will be an "ISO/IEC 16500 conforming application" and will successfully execute on a STU that is compliant to ISO/IEC 16500.

For each monomedia and multimedia component the coding format is specified, as well as applicable constraints for coding of the components. Three types of monomedia components are distinguished. Monomedia components which are included within other monomedia components, such as characters within text, are of type implied. Non-implied monomedia components that do not require synchronization with a time base at play back, are of type stand-alone. Finally, non-implied monomedia components of which the presentation may require synchronization with a time base are of type stream. This part of ISO/IEC 16500 defines which type each DAVIC defined monomedia component may take, and specifies that the coded representation of monomedia components of type stream are packetized in PES packets (for definition of PES packets refer to ISO/IEC 13818-1). PES packets permit (1) to include time stamps to support mutual synchronisation of multiple monomedia components in reference to a common time base and (2) to define timing and buffer behaviour in a common reference model for contents decoding. While there are various ways to deliver the monomedia and multimedia components to the STU, This part of ISO/IEC 16500 defines how the components are carried in an MPEG-2 Transport Stream.

DAVIC specifies a number of different profiles. In a specific profile there may be support of a subset of the monomedia components. Each STU that complies to a specific profile of DAVIC shall be capable of decoding and presenting each monomedia and multimedia component permitted within that profile.

This part of ISO/IEC 16500 also specifies methods for packaging of contents and metadata. The way in which content is packaged for delivery is independent of the way in which content data is delivered to the SPS (it may be delivered to a Service Provider either on physical media or over a transmission system). All programming content is represented in the DAVIC system as multimedia components. Multimedia components comprise one or more monomedia components coupled with the logical relationships between the monomedia components. The multimedia components will be created by content providers for input to the servers.

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2. Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 16500. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 16500 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau (TSB) maintains a list of currently valid ITU-T Recommendations.

2.1. ISO, ISO/IEC and ITU Normative References

1. ISO 639, *Codes for the representation of names of languages*.
2. ISO 3166, *Codes for the representation of names of countries.*
3. ISO/IEC 8859-1:1987, *Information technology - 8-bit single-byte coded graphic character sets - Part 1: Latin alphabet No. 1*.
4. ISO/IEC 10646-1, *Information technology - Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Plane"* (also known as Unicode).
5. ISO/IEC 11172–2:1993, *Information technology—Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s—Part 2: Video* (Note: known as MPEG-1 Video).
6. ISO/IEC 11172–3:1993, *Information technology—Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s—Part 3: Audio* (Note: known as MPEG-1 Audio).
7. ISO/IEC 13522–5:1997, *Information technology—Coding of multimedia and hypermedia information—Part 5: Support for base-level interactive applications* (Note: known as MHEG-5).
8. ISO/IEC 13522-6, *Information technology - Coding of multimedia and hypermedia information - Part 6: Support for enhanced interactive applications*.
9. ISO/IEC 13818-3:1998, *Information technology – Generic coding of moving pictures and associated audio information – Part 3: Audio* (Note: known as MPEG-2 Audio).
10. ISO/IEC 13818–6, *Information technology—Generic coding of moving pictures and associated audio information—Part 6: Extensions for DSM-CC*.
11. ITU-T (CCITT) Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1)* | ISO/IEC 8824: 1990, *Information Technology—Open Systems Interconnection—Specification of Abstract Syntax Notation One (ASN.1).*
12. ITU-T (CCITT) Recommendation X.209 (1988) *Specification of Basic Encoding rules for abstract syntax notation one (ASN.1)* | ISO/IEC 8825: 1990, *Information technology—Open Systems Interconnection—ASN.1 encoding rules—Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER).*
13. ITU-T Recommendation H.222.0 (1995) | ISO/IEC 13818–1: 1996, *Information technology—Generic coding of moving pictures and associated audio information: Systems* (Note: known as MPEG-2 Systems).

    ISO/IEC 13818-1/Amendment 1: 1997, *Registration procedure for "copyright identifier"*.
    ISO/IEC 13818-1/Amendment 2: 1997, *Registration procedure for "format identifier"*.
    ISO/IEC 13818-1/Amendment 3: 1998, *Private data identifier*.
14. ITU-T Recommendation H.262 | ISO/IEC 13818–2, *Information technology—Generic coding of moving pictures and associated audio information: Video* (Note: known as MPEG-2 Video).

    ISO/IEC 13818–2 /Amendment 1: *Registration procedure for "copyright identifier"*.

2.2. Other Normative References

2.2.1 ATSC (Advanced Television Systems Committee)

1. ATSC A/52: *Digital audio compression standard* (AC-3).
   available at ftp://ftp.atsc.org/pub/Standards/A52.
2. ATSC A/53: *Digital television standard for HDTV transmission*.
   available at ftp://ftp.atsc.org/pub/Standards/A53.

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2.2.2 ANSI (American National Standards Institute)

1. ANSI SMPTE 274M-1995, *Television - 1920x1080 Scanning and interface*.
2. ANSI SMPTE 296M-1997, *Television - 1280x720 Scanning, analog and digital representation and analog interface.*

2.2.3 Apple Corporation Inc.

1. *AIFF-C Audio Interchange File Format, version C, allowing for Compression.*
2. *Bento Specification, Revision 1.0d5*, July 15, 1993.

2.2.4 ETSI (European Telecommunications Standards Institute)

1. ETR 162 (October 1995): *Digital broadcasting systems for television, sound and data services: Allocation of Service Information (SI) codes for Digital Broadcasting (DVB) systems.*
2. ETR 211: *Digital broadcasting systems for television, sound, and data services; Guidelines for the usage of Service Information (SI) in Digital Video Broadcasting (DVB) systems.*
3. ETS 300 468 (January 1997*): Specification for Service Information (SI) in DVB Systems Informative Annex C: Conversion Between Time and Date Conventions*.
4. ETS 300 472, *Digital broadcasting systems for television, sound, and data services; Specification for conveying ITU-R System B Teletext in Digital Video Broadcasting (DVB) bitstreams*.
5. ETS 300 743, *Digital Video Broadcasting (DVB), DVB subtitling.*
6. ETS 300 777-2, *Use of Digital Storage Media Command and Control (DSM-CC) for basic multimedia applications.*
7. ETSI DI / MTA-01074, *Multimedia Terminals and Applications, Application Programming Interface (API) for DAVIC Service Information.*

2.2.5 SCTE (Society of Cable Telecommunications Engineers, Inc)

1. SCTE DVS/026 - *Digital Video : Subtitling methods for Broadcast Cable.*

2.2.6 SMPTE (Society of Motion Picture and Television Engineers)

See ANSI (American National Standards Institute)

2.2.7 W3C

1. CSS-1, *Cascading Style Sheets, level 1*; by Håkon Wium Lie and Bert Bos, 17-December-96. available at http://www.w3.org/TR/REC-CSS1-961217.
2. HTML 3.2, *HyperText Mark-up Language reference specification*, by Dave Raggett, 14-Jan-1997. available at http://www.w3.org/TR/REC-html32.html.
3. PNG *Portable Network Graphics version 1*, 01-October-1996. available at http://www.w3.org/TR/REC-png.html.

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