TECHNICAL REPORT

ISO/IEC TR 16501

Information technology — Generic digital audio-visual systems — Technical Report on ISO/IEC 16500 — Description of digital audio-visual functionalities

Technologies de l'information — Systèmes audiovisuels numériques génériques — Rapport technique sur l'ISO/CEI 16500 — Description des fonctionnalités audiovisuelles numériques

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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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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

ISO/IEC TR 16501 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.

Introduction

ISO/IEC TR 16501 provides a detailed listing of the core functions, generic tool capabilities and sample applications required by users and providers of digital audio-visual applications and systems. It introduces the concept of a contour and defines the functions required for IDB (Interactive Digital Broadcast) and EDB (Enhanced Digital Broadcast) contours. The Technical Report complements ISO/IEC 16500. It is the source of the requirements used to identify the generic tool technologies defined in ISO/IEC 16500 and, in particular, it identifies the user needs and market requirements which are addressed by the contour technology toolsets defined in ISO/IEC 16500-3.

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Information technology — Generic digital audio-visual systems — Technical Report on ISO/IEC 16500 — Description of digital audio-visual functionalities

1 Scope

This Technical Report describes the functions that may be supported by systems using ISO/IEC 16500. These functions have been derived by analyzing the requirements of a number of example applications from the viewpoints of a range of participants, including:

- content providers
- service providers
- delivery system providers
- end-users
- equipment manufacturers

- IPR holders
- rights collection agencies
- regulatory authorities
- business support services
- financial services

Applications, tools and functions are described from a behavioral viewpoint. The report does not assume any technical implementation for a particular service.

The Technical Report consists of a main body, and a series of Annexes. The main body introduces the concept of a contour in the context of ISO/IEC 16500 and outlines its use in compliance and conformance definitions. The behaviour and parameters of sets of core functions and generic tools that can be derived from the functions are then presented. Nineteeen example applications are analysed and described in terms of generic and application specific functionalities. The main body concludes with an integrated summary listing of the functionalities required by users and providers of digital audio-visual applications and systems organised under a set of functional groupings. The User and Market Requirements and the corresponding Functional Requirements required for the IDB (Interactive Digital Broadcast) contour are defined in Annex A. Similar information is provided in Annex B for the EDB (Enhanced Digital Broadcast) contour. This overall structure is designed to readily incorporate future descriptions of new core functions, generic tools, sample applications and additional contours.

2 Sources for the identified audio-visual functions

The functions specified in this Technical Report were derived by analyzing the requirements of a number of example applications, and the generic requirements common to a range of applications. The applications considered were all taken from the responses to the calls for proposals issued by DAVIC, and prioritized during discussions within the DAVIC Applications Technical Committee. The example applications were used as the focus for requirements analysis, and it is expected that a wide range of applications can be implemented using this Technical Report and ISO/IEC 16500.

3 Definitions

This clause defines new terms, and the intended meaning of certain common terms used in this Report. ISO/IEC 16500-1 Annex A defines additional terms and, in some cases, alternative interpretations that are appropriate in other contexts.

3.1. **Access Control:** Provides means to access services and protection against the unauthorized interception of the services.

3.2.   Access Network: a part of the Delivery system consisting of a collection of equipment and infrastructures, that link a number of Service Consumer Systems to the rest of the Delivery system through a single (or a limited number of) common port(s).

3.3.   Application: a set of objects that provides an environment for processing Application Service Layer information flows.

3.4.   Application Programming Interface (API): set of inter-layer service request and service response messages, message formats, and the rules for message exchange between hierarchical clients and servers. API messages may be executed locally by the server, or the server may rely on remote resources to provide a response to the client.

3.5.   Assets: Things that a user sees or hears, e.g., bitmap, audio, and text.

3.6.   Channel surfing: Viewing of many broadcast channels in a short time period by the End user.

3.7.   Client: a service consuming object or system (block); (a synonym for **user**)

3.8.   Compliance to a contour: providing all of the system functions specified in a contour according to the mapping to ISO/IEC 16500 technologies specified in the corresponding annex of ISO/IEC 16500-3. *See* subclause 6.1.2

3.9.   Conditional Access: A means of allowing system users to access only those services that are authorized to them.

3.10.   Confidentiality: the protection of information from unauthorized disclosure

3.11.   Conformance to a contour: providing system functions, as defined in a particular contour, used by the services in a system for which conformance is declared. *See* subclause 6.1.1

3.12.   Content Provider: one who owns or is licensed to sell content.

3.13.   Control Word: the secret key used for a scrambling algorithm.

3.14.   Control-information: information that may change the state of the object intercepting the information flow, e.g., a remote control channel up command input. (In some cases an object may interpret a message but reject a request and remain in its current state.)

3.15.   Distribution Network: a collection of equipment and infrastructures that delivers information flows from the Access Node to the Network Termination elements of the Access Network.

3.16.   Email: Electronic mail. Email allows the sending of information in an electronic format from one Internet user to another. Users are identified on the Internet by a unique email address.

3.17.   Entitlement Control Message (ECM): Conditional Access messages carrying an encrypted form of the control words or a means to recover the control words, together with access parameters, i.e., an identification of the service and of the conditions required for accessing this service.

3.18.   Entitlement Management Message (EMM): Conditional Access messages used to convey entitlements or keys to users, or to invalidate or delete entitlements or keys.

3.19.   FTP: File Transfer Protocol. FTP allows a connection to be made between two Internet computers in order to transfer files between them.

3.20.   Function: Features of a Digital AudioVisual System that are realized through Services. For example, interactive play control (VCR-type controls) is a function. (See also **Service**)

3.21.   Hierarchy: an arrangement of objects in order of rank; some objects in the arrangement are subordinate to others; objects of the same hierarchical rank are peer objects

3.22.   HTML: Hypertext Mark-up Language. HTML is a document formatting language used to specify the format of Hypertext documents on the World Wide Web. HTML consists of ASCII text files with special tags to specify formatting information. This includes the specification of Hypertext links, graphics information and plain text.

3.23. **HTTP**: Hypertext Transfer Protocol. HTTP is the protocol Web servers and browsers use to send request, accept request, send responses and receive response of documents on the World Wide Web. It also specifies how to initiate transfers of data using other protocols such as FTP and SMTP.

3.24. **Hypertext**: Hypertext is text that a user may select in some manner to cause some different set of information to be retrieved and displayed. A common example is a link on a Web page, which may be selected causing a new Web page to be retrieved.

3.25. **Interface:** a point of demarcation between two blocks through which information flows from one block to the other.. A DAVIC interface may be a physical-interface or a logical-interface.

3.26. **Internet**: The term Internet is used in many ways in this document. It is widely understood to mean the global network of computers tied together via different types of networks. These computers use a standard set of protocols to communicate, mainly TCP/IP and UDP/IP.

3.27. **Key management:** The generation, storage, distribution archiving, deletion, revocation, registration, and deregistration of cryptographic keys.

3.28. **Navigation:** the process of reaching a service objective by means of making successive choices; the term may be applied to the selection of a service category, a service provider or an offer within a particular service.

3.29. **Network:** a collection of interconnected elements that provides connection services to users

3.30. **Network control function:** The Network Control Function is responsible for the error-free receipt and transmission of content flow information to and from the Server.

3.31. **Non-repudiation:** the proof of the origin and reception of a message. This means that the sender cannot deny the sending of the message and the receiver cannot deny the reception of the message.

3.32. **Partition:** a decomposition or subdivision of an object into smaller objects; the created objects are peers with respect to each other, but are hierarchically subordinate to the original partitioned object

3.33. **Peer:** of the same rank or order peer objects belong to the same layer (category or classification).

3.34. **Physical interface:** An interface where the physical characteristics of signals used to represent information and the physical characteristics of channels used to carry the signals are defined. A physical interface is an external interface. It is fully defined by its physical and electrical characteristics. Logical information flows map to signal flows that pass through physical interfaces.

3.35. **Plane:** a category that identifies a collection of related objects, e.g., objects that execute similar or complementary functions; or peer objects that interact to use or to provide services in a class that reflects authority, capability, or time period. Management-plane service objects, for example, may authorize ISP-clients' access to certain control-plane service objects that in turn may allow the clients to use services provided by certain user-plane objects.

3.36. **Privacy:** privacy protects authorized participants from illegal utilization or knowledge of information related to their components in the DAVIC System

3.37. **Protocol:** set of message formats (semantic, syntactic, and symbolic rules) and the rules for message exchange between peer layer entities (which messages are valid when)

3.38. **Real-time**: Quality of a process, the execution of which is determined or controlled in time. The term is sometimes extended to refer to a delivery process which is perceived fast enough to be considered as almost instantaneous.

3.39. **Reference point:** a set of interfaces between any two related blocks through which information flows from one block to the other. A reference point comprises one or more logical (non-physical) information-transfer interfaces, and one or more physical signal-transfer interfaces.

3.40. **Server:** any service providing system.

3.41. **Service provider:** an entity that provides a service to a client.

3.42. **Session:** an interval during which a logical, mutually agreed correspondence between two objects exists for the transfer of related information. A session defines a relationship between the participating users in a service instance.

3.43. **Specification:** a definition of the requirements of a system. A specification consists of general parameters required of the system and the functional specification of its required behavior. Specification may also be used as shorthand for specification and/or description, e.g., in SDL specification or system specification.

3.44. **Symbol:** a bit or a defined sequence of bits.

3.45. **System:** a collection of interacting objects that serves a useful purpose; typically, a primary subdivision of an object of any size or composition (including domains)

3.46. **User:** a service consuming object or system

3.47. **Virtual channel:** communication channel that provides for the sequential unidirectional transport of ATM cells

4   Acronyms and abbreviations

This clause defines the acronyms and abbreviations used in this Technical Report. Additional acronyms and abbreviations relevant to digital audio-visual applications is available in Annex B of ISO/IEC 16500-1.

CA	Conditional Access
DVB	Digital Video Broadcasting
DVB-SI	DVB - Service Information
ECM	Entitlement Control Message
EMM	Entitlement Management
EPG	Electronic Program Guide
HDTV	High Definition Television
HTML	HyperText Markup Language
IP	Internet Protocol
IPR	Intellectual Property Rights
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ITU	International Telecommunications Union
JPEG	Joint Photographic Experts Group
KOD	Karaoke-On-Demand
Mbps	Megabits per second
MOD	Movies-On-Demand
MPEG	Moving Picture Experts Group
MPEG-TS	MPEG Transport Stream
NVOD	Near Video-On-Demand (Also N-VOD)
PG	Parental Guidance
PIN	Personal Identification Number
PPV	Pay-Per-View
QoS	Quality of Service
STB	Set-Top Box
STU	Set-Top Unit

UPI	User Premises Interface
VASP	Value Added Service provider
VOD	Video-On-Demand

5   Conventions

The style of this Report follows the general guidelines of the *Guide for ITU-T and ISO/IEC JTC 1 cooperation. Appendix II: Rules for presentation of ITU-T | ISO/IEC common text (March 1993)*

6   DAVIC Contours

The purpose of contours is to enable the building of marketable products by translating market requirements into functional specifications and then to technological solutions. The whole process is shown in Figure 6.1.
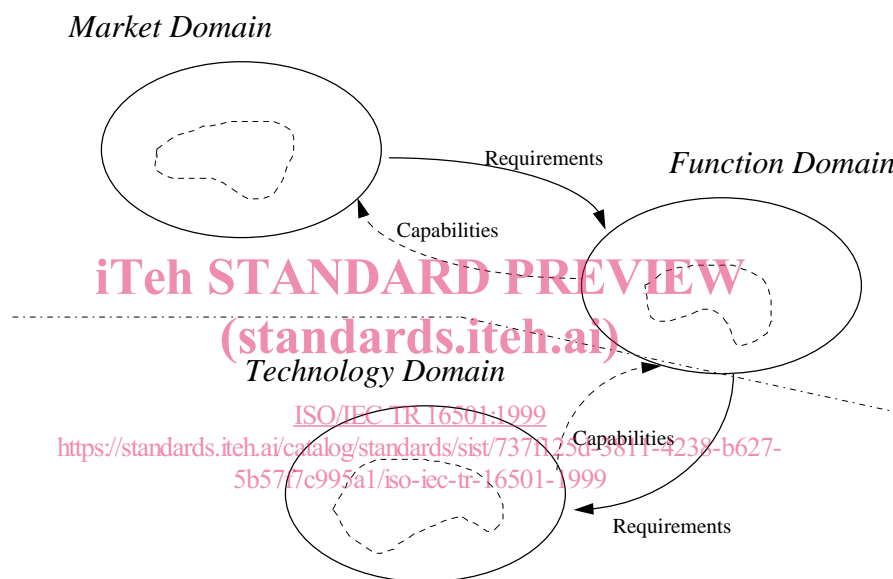

Figure 6.1 — Contour Domains

A contour is expressed in three domains:

- in the Market domain, as a set of market and user requirements;

- in the Function domain, as a set of functional requirements; and

- in the Technology domain, as a set of system functions and selected tools.
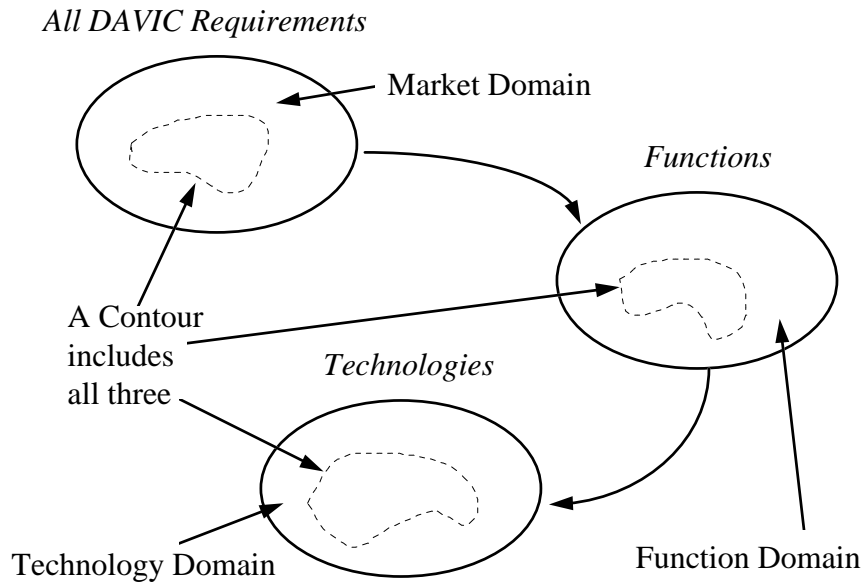
All DAVIC Requirements

Figure 6.2 — Contour Definition

A contour consists of three separate essential items of information which describe:

- a set of user and market requirements with a focus on a market segment;

- a set of functional specifications for interoperable DAVIC system components derived from the user and market requirements; and

- a set of technologies supporting the functional requirements.

Each contour is developed in a two step approach and is best understood using the following two documents:

- This Technical Report which describes the User & Market Requirements and provides a list of Functional Requirements. These are system-level requirements, not sub-system level and they do not define physically where in the system a particular function has to be executed;

and

- ISO/IEC 16500-3 which contains a corresponding Annex which lists the technologies required to fulfil the functionality identified for each contour and, where appropriate, assigns specific DAVIC components from ISO/IEC 16500 to achieve the required technologies.

DAVIC contours are used to define systems, derived from User & Market requirements. They describe fully the functions and their mapping to the DAVIC technologies required to implement marketable solutions. There is no implied relationship between one contour and another. A contour may be a superset, a subset or be completely independent of another.

Systems, which are implemented according to the contour, may also implement functions and technologies outside the contour (including those outside DAVIC).

6.1 Conformance and Compliance

The following definitions apply.

6.1.1   Conformance

DAVIC defines a system to be *conformant* to a contour when it uses the contour as a guide but may omit functions where appropriate (for example in the case of regional solutions to optimize cost-effectiveness). All functions that are selected from the contour must be executed according to the mapping to DAVIC technologies specified in the appropriate annex to ISO/IEC 16500-3.

6.1.2   Compliance

DAVIC defines a system to be *compliant* with a contour when it is capable of executing all functions that are specified in the appropriate annex to ISO/IEC TR 16501, according to the mapping to DAVIC technologies specified in the corresponding annex to ISO/IEC 16500-3, and meets all of the requirements of the contour.

7   Functions Required to Support DAVIC Applications

7.1   Core Functions

DAVIC compliant systems are intended to facilitate the introduction of a wide variety of applications. These applications will consume system resources and have functionality that is spread across a number of DAVIC subsystems. Examples of applications are given in clause 9. These applications have both common and specific functionality. Future applications which require the definition of additional and new functions can easily be accommodated by adding them to the current list of core functions below.

However, it is possible to identify core DAVIC functions that are basic to the system's operation, integrity and development. These functions provide core functionality to the system and all its running applications. They may be subdivided into the following groups: -

- Bit Transport

- Session

- Access Control

- Navigation, Program Selection & Choice

- Application Launch

- Media Synchronization Links

- Application Control

- Presentation Control

- Usage Data

- User Profile

Figure 7.1 depicts the interrelationship of these core functional groups and running applications.